ELECTRICAL TIMES

THURSDAY
27 SEPT.
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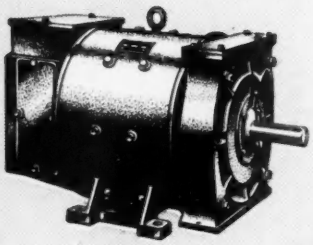
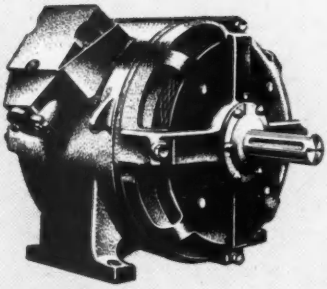
They bear the name

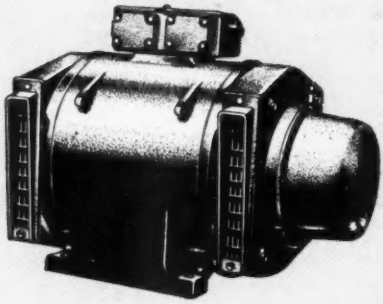


G.E.C.



. . . and a name

for *RELIABILITY*



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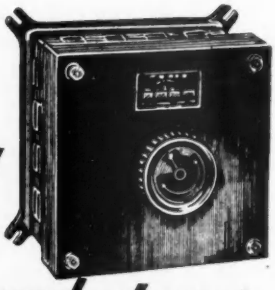

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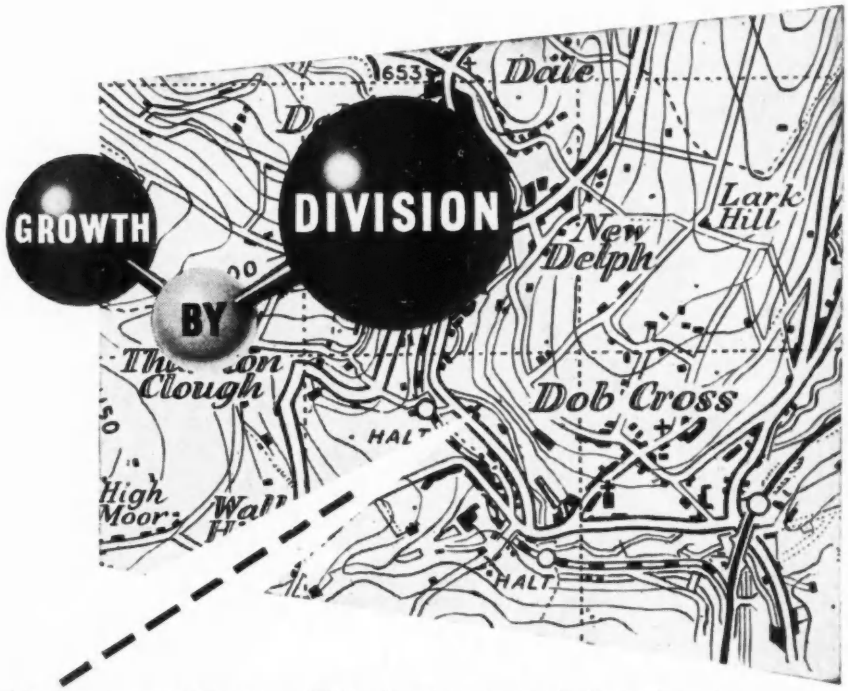

We have grown from *here*. This advertisement is the first of a series which will tell you about our Company and our products. Ours is the story of growth by division, a pattern we planned years ago, believing that in a highly technical industry small specialised manufacturing units can be more efficient and give better service than large ones.

We are *one* company operating in three different fields. Each division is a business on its own, for each has a separate factory, technical staff and commercial organisation. Perhaps you, like many others of our friends, only know one division of our business . . . in these advertisements you will be introduced to them all.

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ELECTRIC CENTRAL HEATING WATER BOILERS

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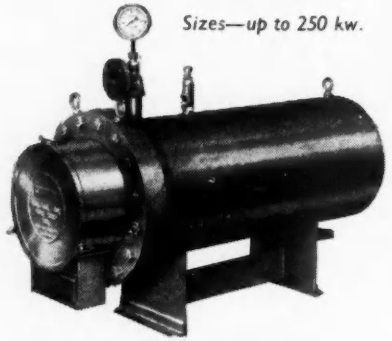

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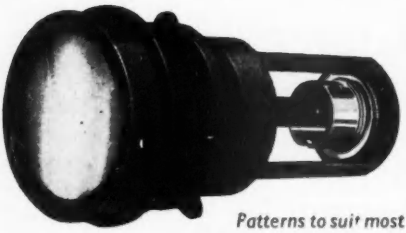

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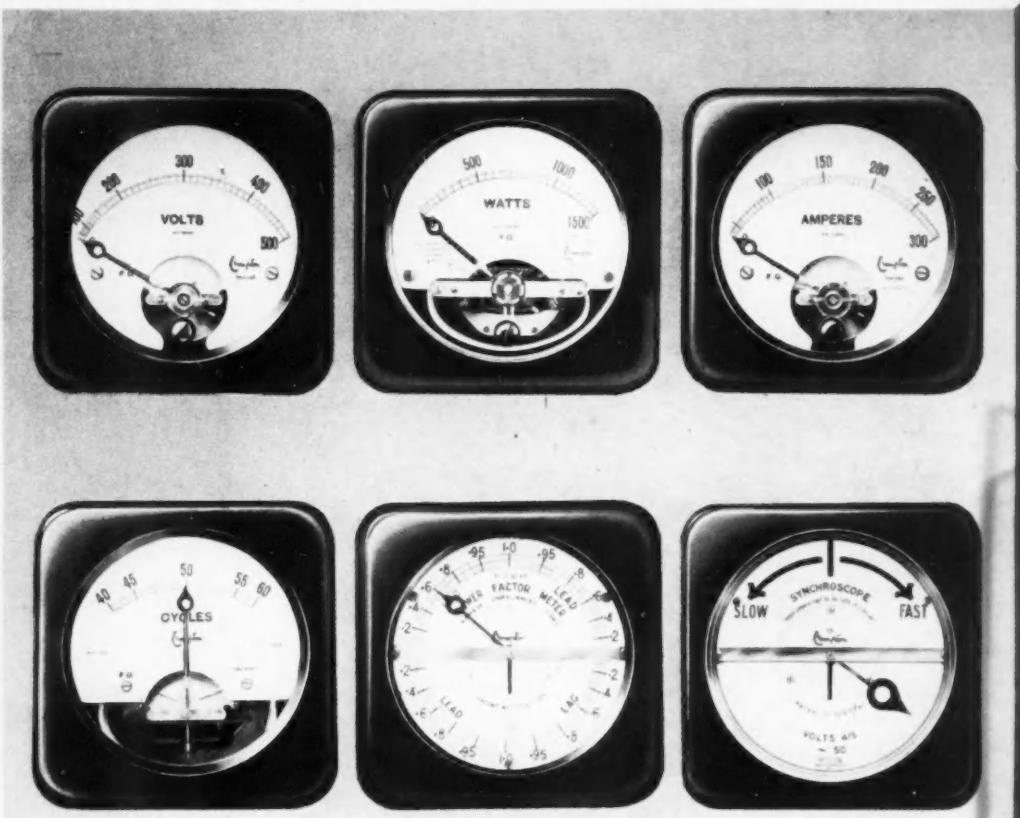

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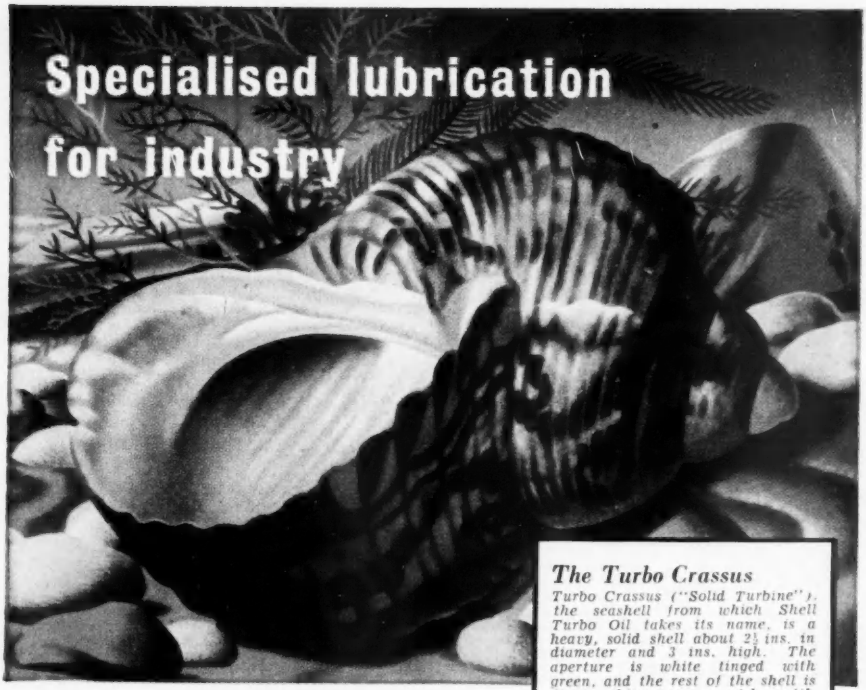

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Turbo Crassus ("Solid Turbine"), the seashell from which Shell Turbo Oil takes its name, is a heavy, solid shell about 2½ ins. in diameter and 3 ins. high. The aperture is white tinged with green, and the rest of the shell is dirty white or greenish, with angular black or brown patches on the ribs. Found off the coasts of North Australia and New Caledonia.

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This model is specially designed for use with porcelain clad fuses and heavy duty conductors up to 4" dia.

Fully insulated core.

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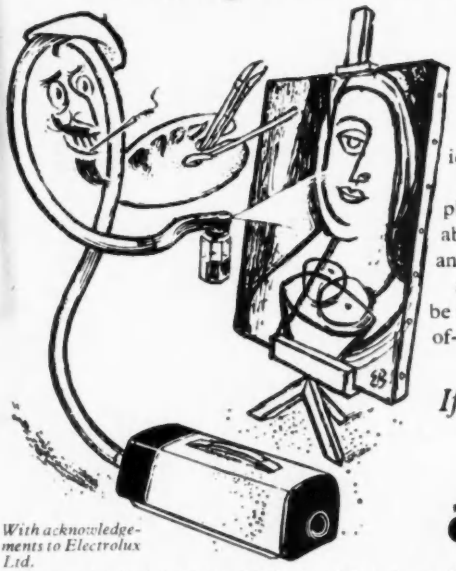

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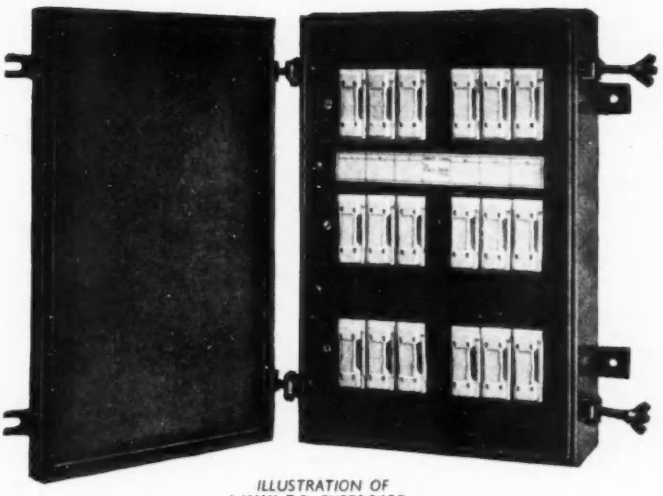

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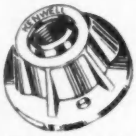

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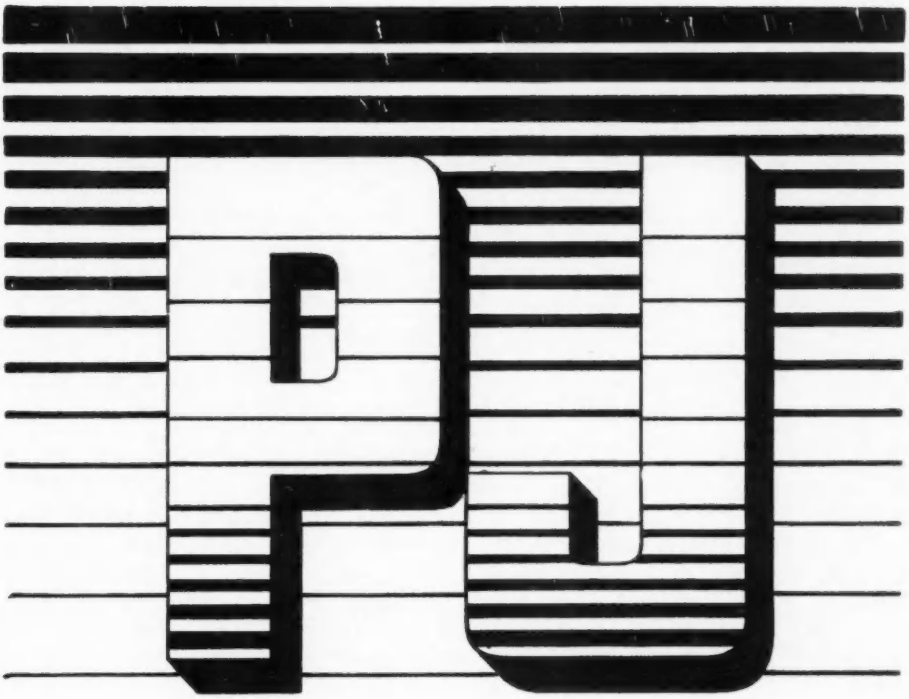

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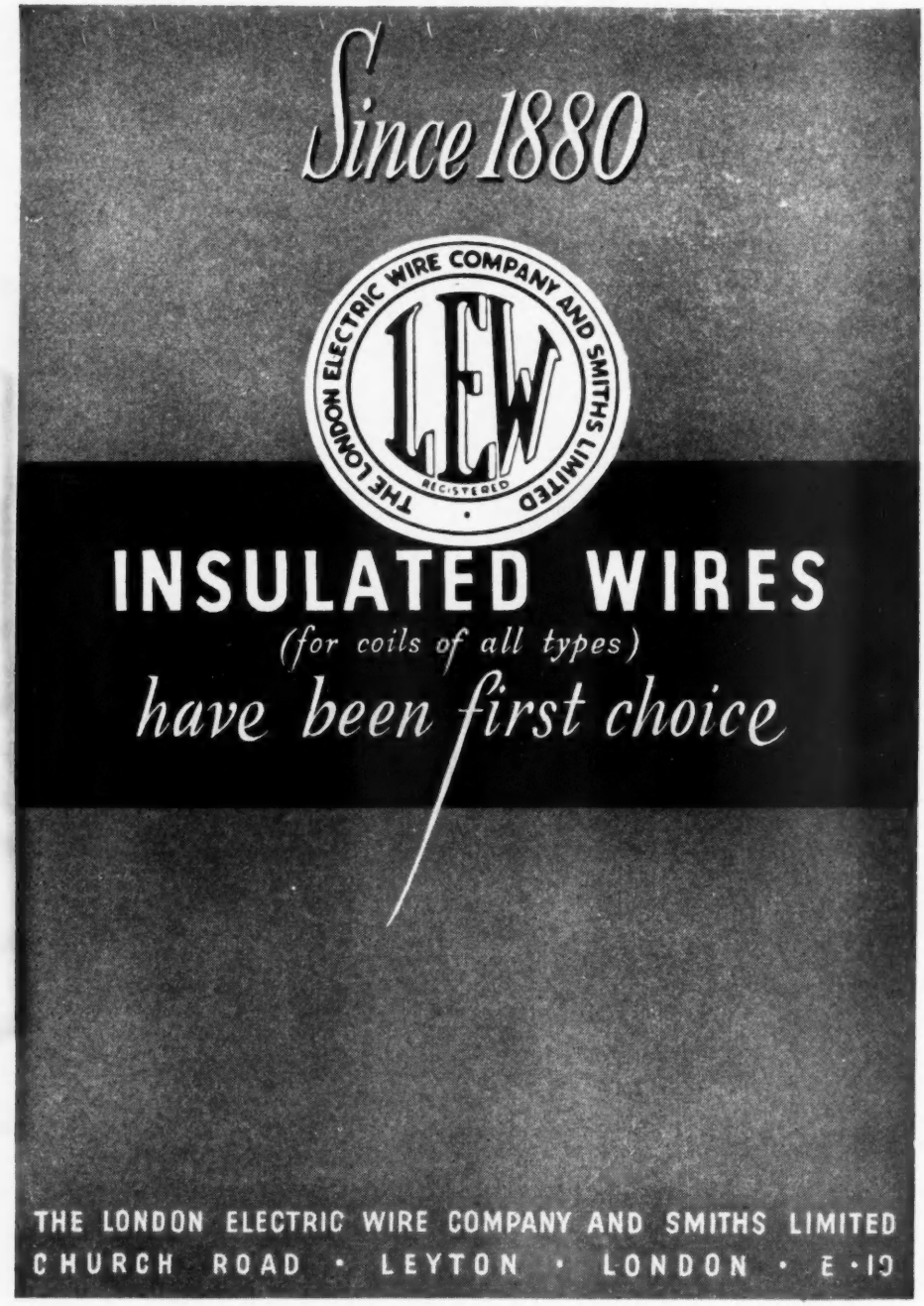
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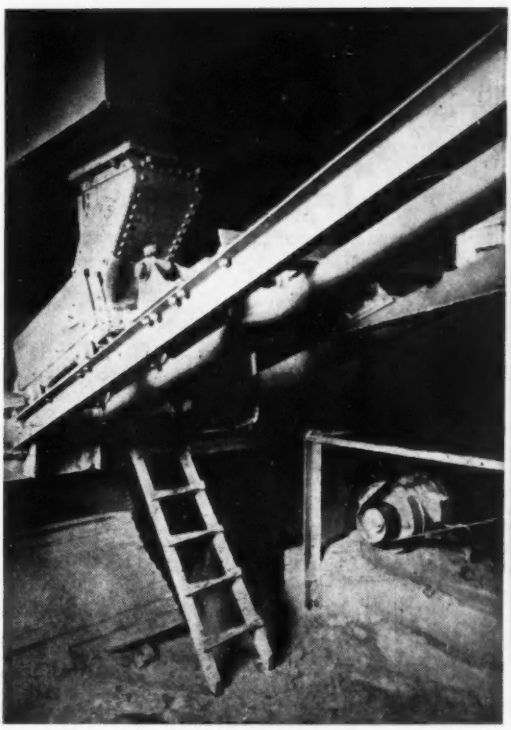

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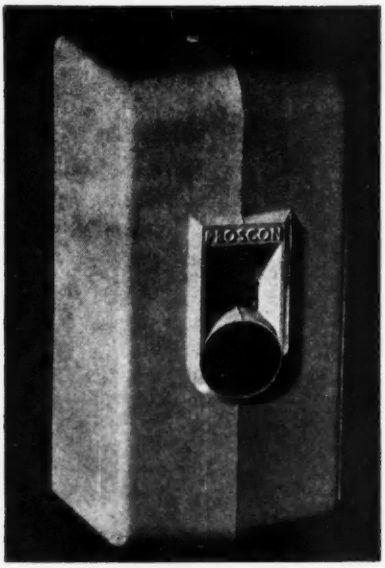

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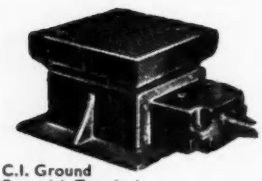
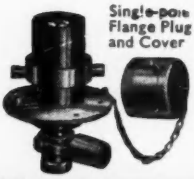

C.I. Ground Box with Terminal Sealing Chamber & Gland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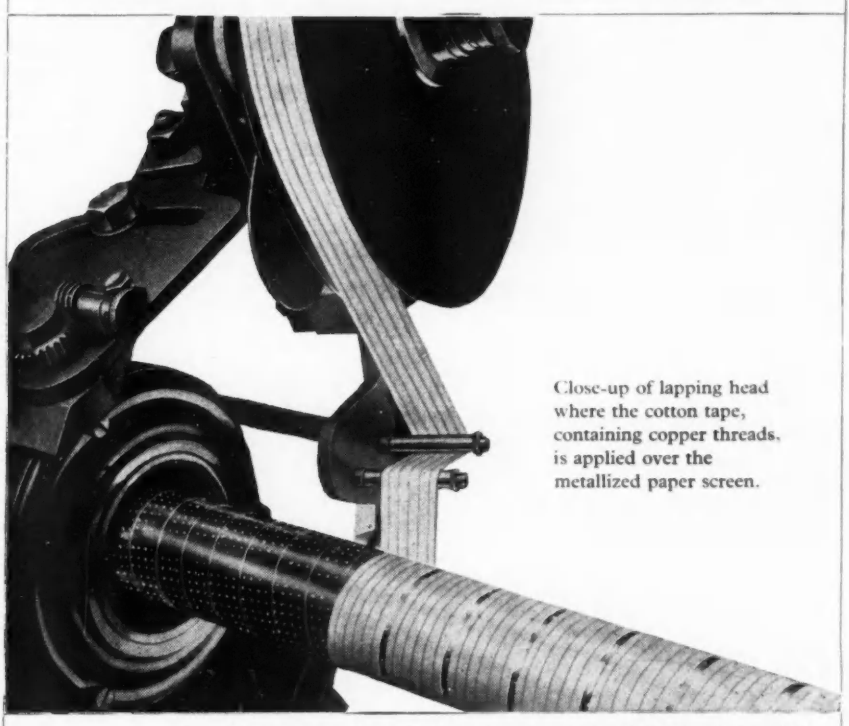

Close-up of lapping head where the cotton tape, containing copper threads, is applied over the metallized paper screen.

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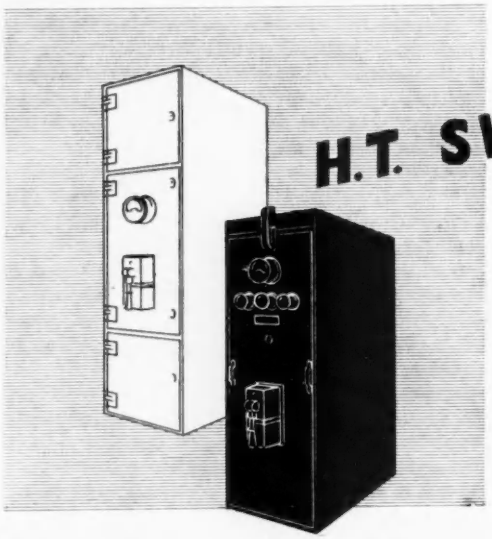

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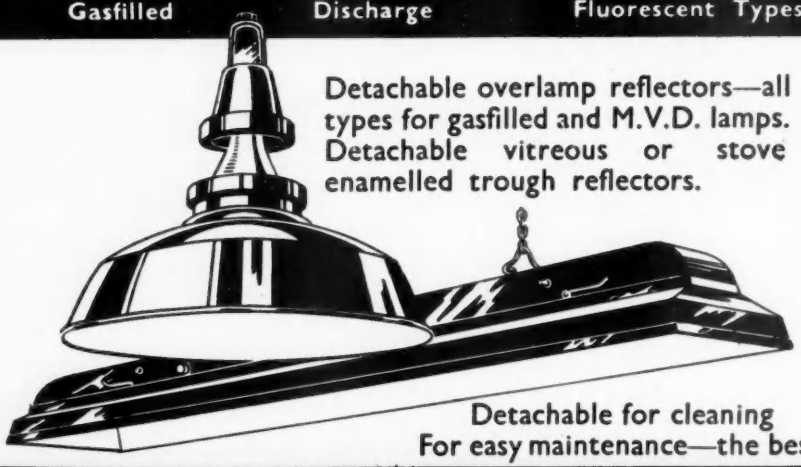

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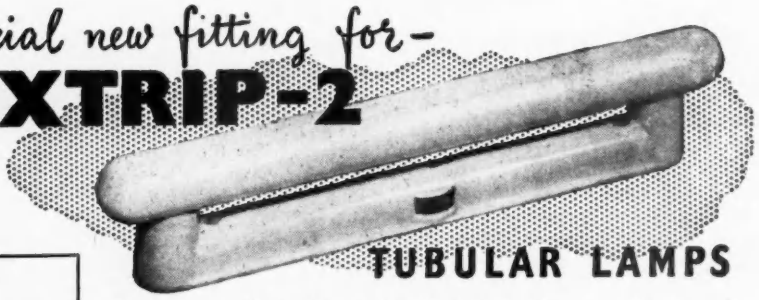

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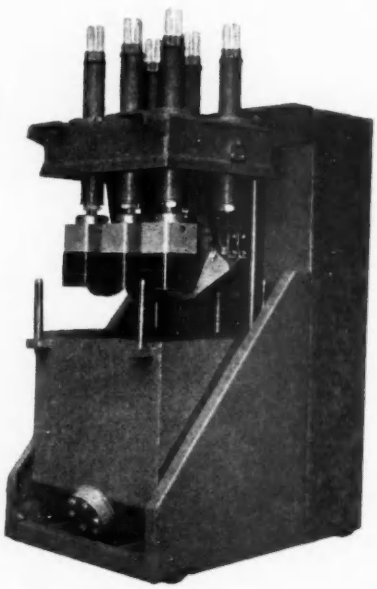

11kV 150 MVA O.C.B. fitted with PERMALI cross-jet pots and moving contacts operating links. Photo by courtesy of The General Electric Co., Ltd.

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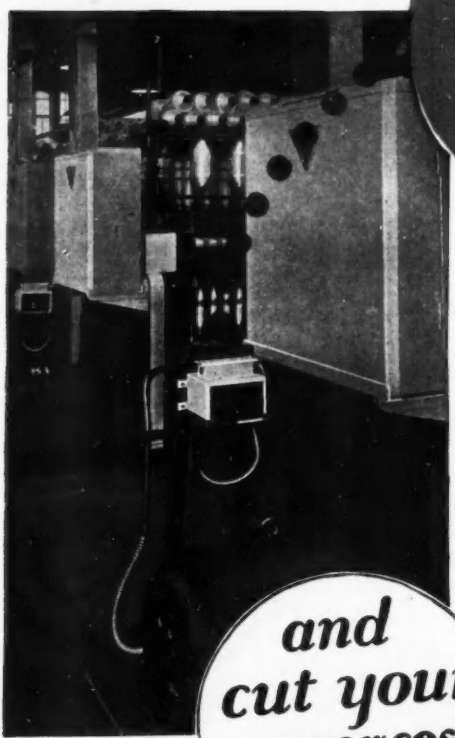

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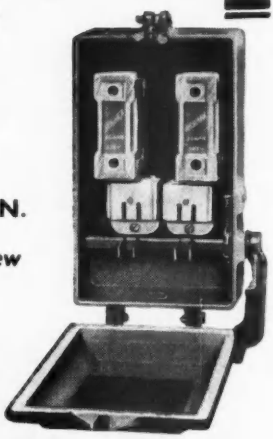

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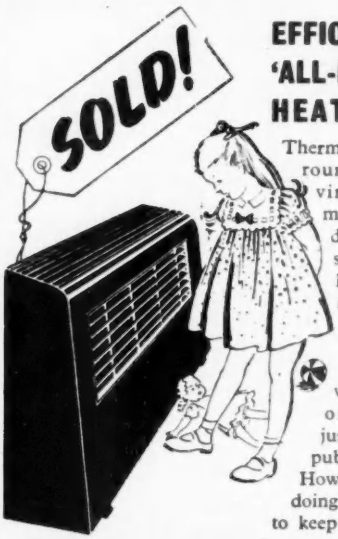

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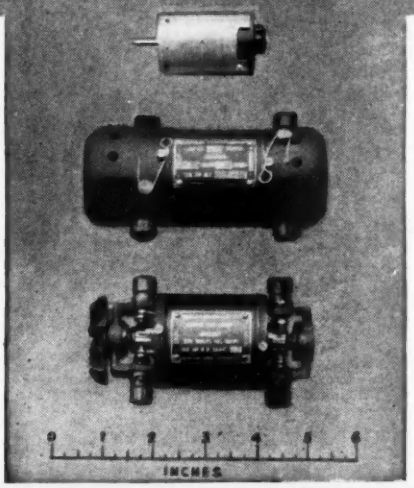

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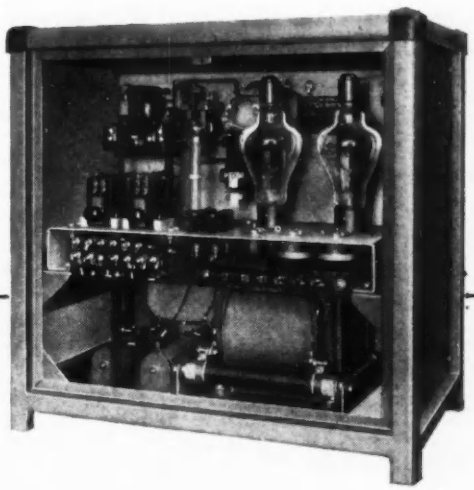

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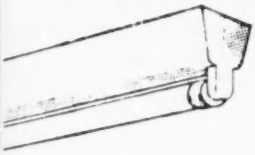

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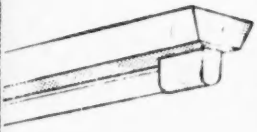

Type
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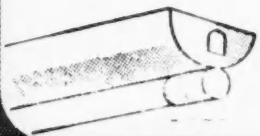

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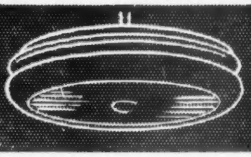

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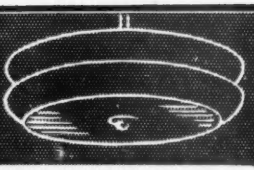

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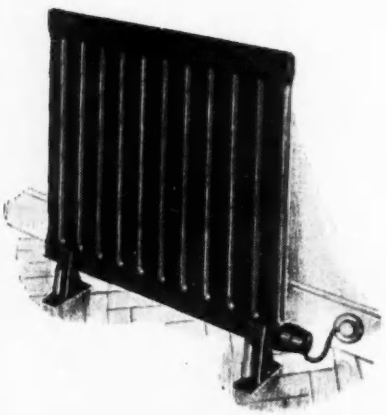

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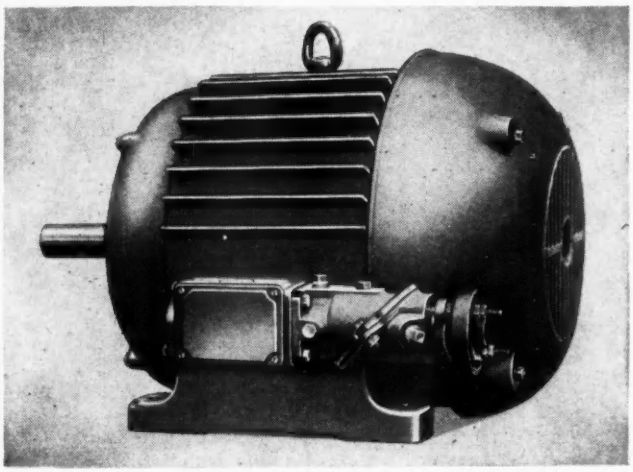

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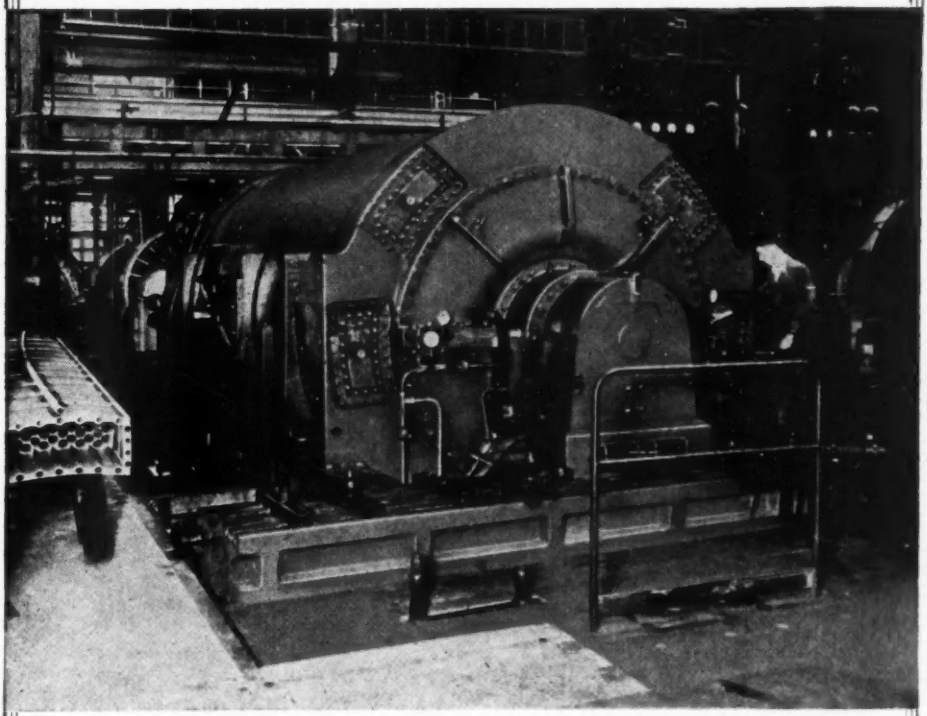

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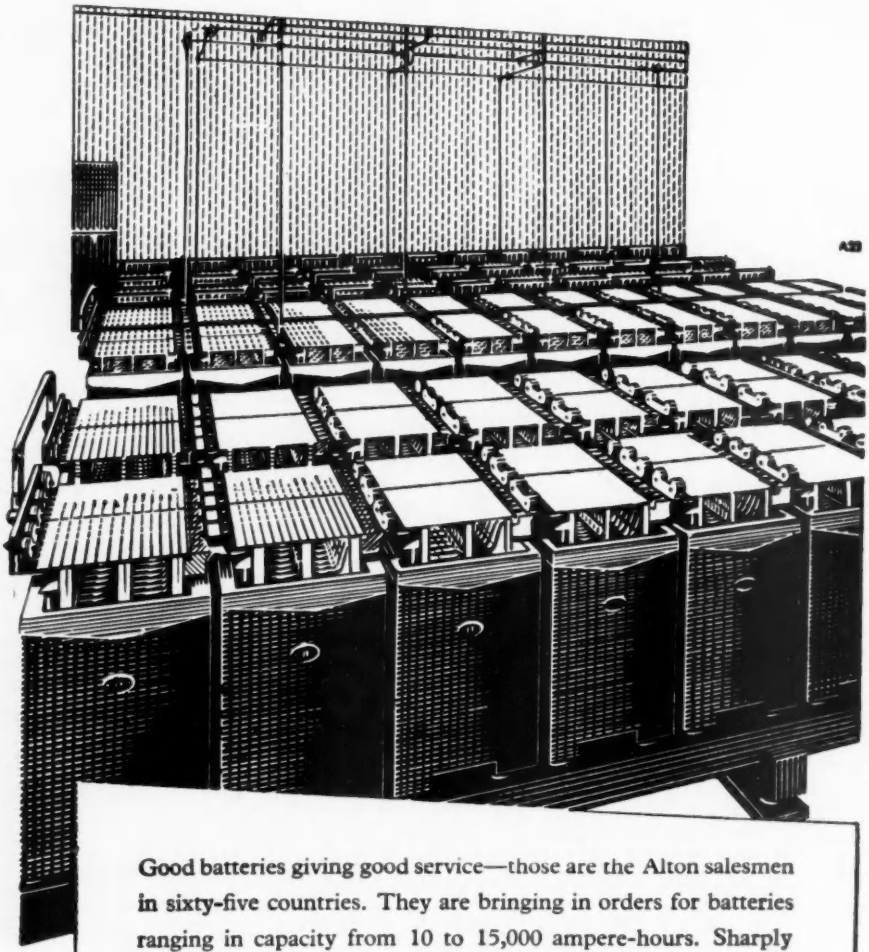

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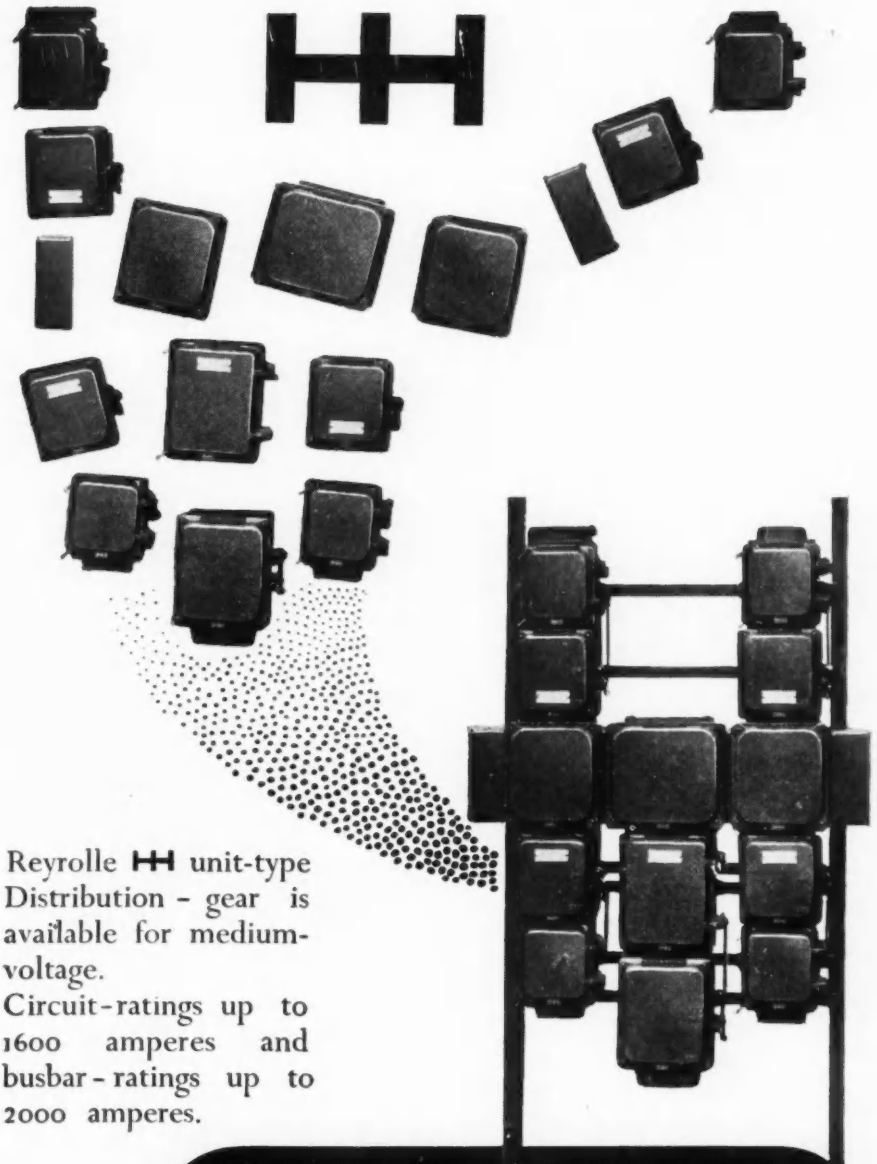

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Photographs by courtesy of Docks and Inland Waterways Executive.

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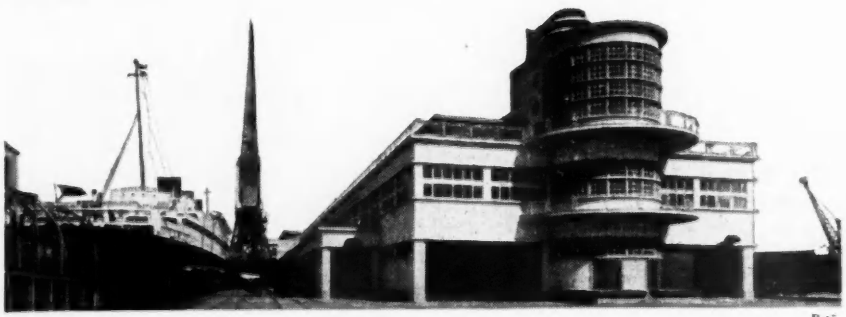

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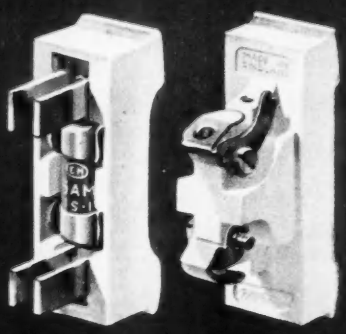

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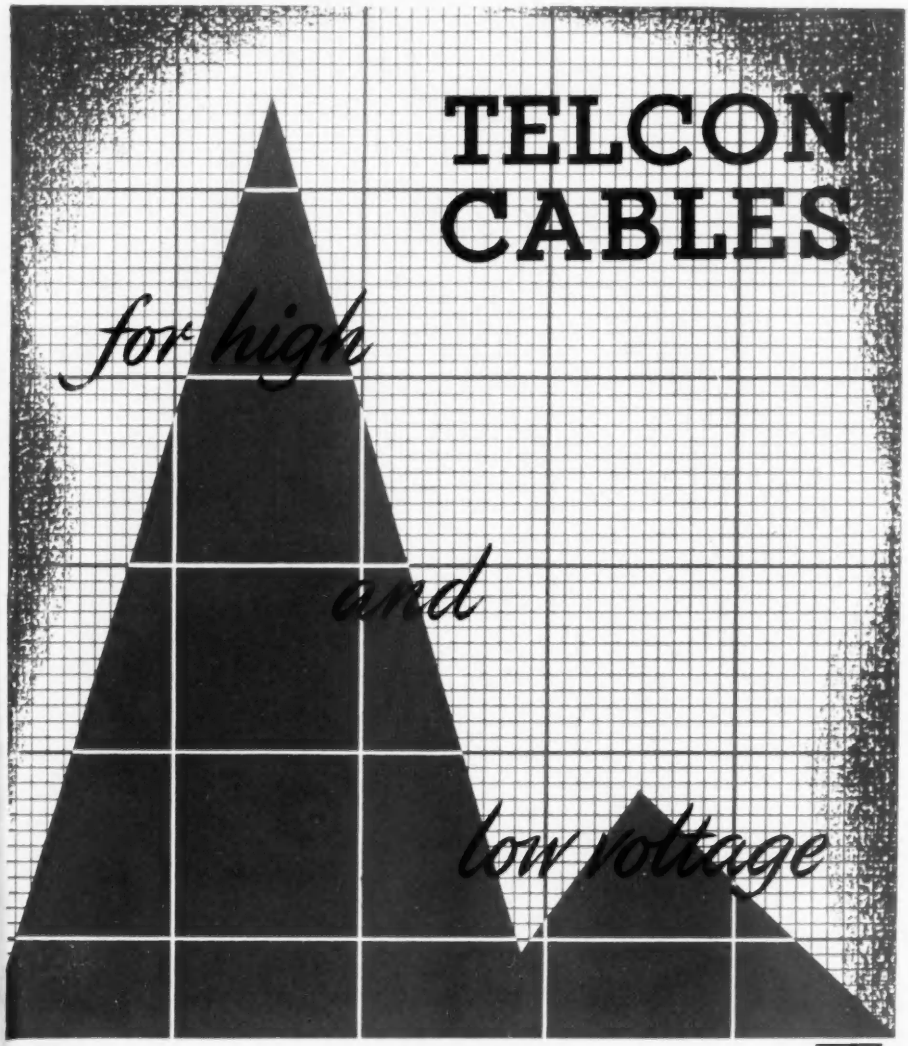

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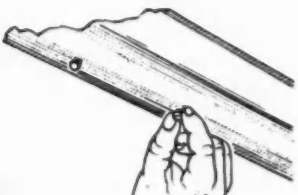
1 Remove ceiling rose and mount anchor plate with 4 screws direct to ceiling.

2 Attach fitting by means of the two chains provided and connect to circuit.



3 Using two captive screws supplied, attach Maxilite to anchor plate.

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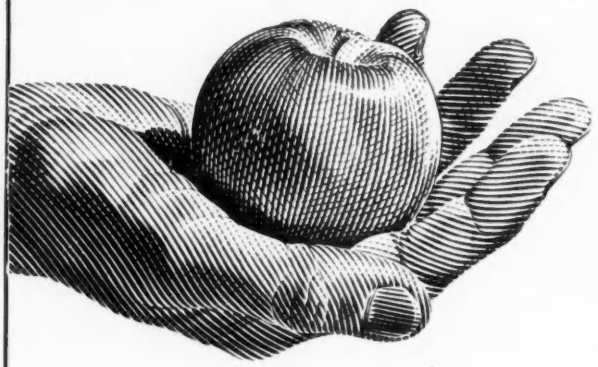
C



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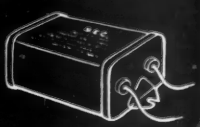

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

Editorial

COLLEGE OF TECHNOLOGISTS

WHEN the Weeks' Council report on higher technological education was published in November last year this paper headed its summary of the proposals put forward "Another Set of Letters." The choice of this title has proved prophetic, for the newly published White Paper which sets forth government policy on matters discussed in the report retains the much-debated College of Technologists only as an award-granting body. In the emasculated version adopted by the Government, the Weeks' Council concept of a "national educational body of high standing . . . to assist in securing for technological education generally its rightful status in public esteem" is abandoned, and some of the objections to the scheme presented by the three major professional engineering institutions are thus met. In view of the public and forthright opposition of these bodies to the full realisation of a multi-functioned Royal College of Technologists, some such compromise was certainly necessary, but it is by no means certain that the I.E.E. and its sister institutions are really happy with the new proposals. No doubt they will take advantage of the Ministry of Education's assurance, that further comments and help in hammering into shape the new policy will be welcome.

USING THE MONEY

TWO other suggestions of the Weeks' Council met with more general support: the development of new courses in advanced technology and the granting of increased financial aid to technical colleges. These ideas are incorporated in the Government's policy, and will of themselves do much to improve higher technological studies though a lot depends on the form in which this promised increase in assistance is granted: details are to be made public "very shortly." Care should be taken that the available money is not spread too thinly over the many possible technical colleges, so that none has a notable improvement in standards. The related idea of investing the available money in a "technological university," which was canvassed so widely some months back, has been shelved on grounds of manpower and building shortages, and M.o.E. permanent officials seem rather against concentrating intended grants on a relatively few technical colleges. Yet only if a small number of colleges of the highest reputation are selected, and given the necessary finance to improve their facilities and extend their staff, can the required improvement in technological, as distinct from technical, education be obtained. The precise proposals on finance are a matter of first-rate importance.

FLUORECTANGULARITY

M. GAYMARD'S paper on fluorescent street lighting in France leaves little doubt about his feelings on the subject of tilted lanterns. In certain wide thoroughfares light distribution has necessitated tilting up to as much as 50 deg. from the normal horizontal position, which M. Gaymard considers ugly in the extreme. Meteor feels that this is a moot point. Unless short tubes are used, no amount of clever design can disguise the fact that the fluorescent lantern is bulky and lengthy. There seems little reason why it should not be tilted, in fact there seems every reason to suppose that this would actually improve its appearance by foreshortening, reducing both the overhang and the uncompromising rectangularity so characteristic of more conventional arrangements. An inclined 2-ft lantern for class B roads was shown last year, and its appearance was sufficiently pleasing to make experiment with the longer unit seem well worth while.

RULES REMAIN FIXED

HOW would the electrician of 1909 feel if he were given a modern factory electrical

installation to look after? The question is prompted by the appearance of a new edition of the explanatory memorandum which the Senior Electrical Inspector of Factories prepares on the regulations he administers: regulations which were, in the greater part, drafted at the beginning of the century. It is 27 years since the last edition was issued, and in this period again there have been many changes. In fact, in reading the new document Meteor's first impression was of the commentary it offered, in its differences from the third edition, on changes in plant and practice since 1924. Gone are the comments on slate and marble switchboards, and the detailed concern with direct current circuits and with arc lamp maintenance, and where protective gear is mentioned, there is a marked modification of attitude. Above all, there is one completely new subject for comment—electronics, with the use of high frequency currents as a special case. How long, one must wonder, will Mr. Swann's memorandum remain up to date, and how long will the regulations in their original drafting remain workable?

THE LATEST GAME

NOT even the present shortage of paper nor its high price can quell the popularity of the latest entertainment, the game of The Missing Megawatts. Anyone can play it; no skill is required; all that is necessary is to string lots of figures together, it doesn't matter what they are as long as each has "MW" after it. The winner is the competitor who takes longest time to reach one of two conclusions; either something ought to be done about it or nothing can be done about it. The game is played by the Labour Party, the Conservative Party, the Liberalites, the Bevanites; after-dinner speakers speak about it, editorial writers write about it, ministers mumble and industrialists grumble, all about the shortage of generating plant. Even the haughty Treasury has now joined in the fun. In the September issues of their "Bulletin for Industry," load-shedding is given pride of place, and the case is presented strictly according to the rules of the game. But after the formal conclusion, the article goes on to say "Every step which tends to flatten the peak and raise the trough leads to a better use of our generating resources." For years Meteor has been trying to convince the Treasury of this very point and that they have got their purchase taxes all mixed up so as to produce the opposite effect. Perhaps we can now hope that the Treasury will give this Treasury Bulletin to the Treasury to read.

Meteor

THIS WEEK'S PHOTO

HACKNEY generating station, now operated by the London Division of the British Electricity Authority, was previously owned by the Hackney Borough Council. The station was first commissioned in October, 1901, when the plant consisted of two Willans and Robinson 500 h.p. engines, each driving 2-150 kW J. H. Holmes dynamos coupled in tandem, and two Belliss and Morcom 1,000 h.p. engines, each driving two-300 kW dynamos in tandem, making a total capacity of 1,800 kW. The Hughes and Stirling boilers producing steam at 250 lb/sq in. were fired by refuse and were situated in the destructor works adjoining the engine room. This was in the days when the refuse collected in the borough contained a large percentage of partly burnt coal and ash.

Various extensions were later made. A 3,000 kW Willans and Robinson turbo-alternator was installed in 1912 with four Babcock boilers, and later various small turbo-alternator sets were added, bringing the capacity up to 31,000 kW. In 1930 a Parsons 30,000 kW set was installed and a further one in 1938, together with the first concrete cooling tower to be built in the London area. Steam to these two sets is by five 150 klb/hr Simon-Carves boilers with chain grate stokers. This made the total plant capacity 91,000 kW, which it is today. In the 12 months to March 31 last, units sent out totalled 221·7 millions, the thermal efficiency being 18·80%.

In the foreground of our photograph can be seen the site clearance for the initial stage of the new power station, which will ultimately contain five 30,000 kW turbo-alternator sets and five 300 k lb/hr boilers. The plant already ordered consists of two such sets by C. A. Parsons, and two Simon-Carves boilers. Firing will be by pulverised fuel and the steam conditions will be 625 lb/sq in. at 865° F. Circulating water will be drawn from the River Lea. A cooling tower is also being provided against unusually low river flow conditions in the summer months. Coal will be river borne, and, although unloaded at the station side of the canal, it will be stocked on land on the opposite side. A conveyor bridge will span the canal.

ELECTRICAL TIMES POWER STATION SERIES
No. 79.
Hackney

CHEAPER LINES

if unearthed construction is used

Ideas for Economies on Light o/h Circuits

By J. McCOMBE, Ph.D., A.R.T.C., M.I.E.E.

ALL overhead line engineers are aware of the appreciable increases in labour and material costs during the past few years. In my recent article in this journal, details were given of Silmalec aluminium alloy conductors and their use on lines of earthed construction. The adoption of unearthed construction affects a considerable saving in the initial cost of a line. The omission of the continuous earth wire and attendant costs of handling and erection represent a considerable percentage of the conductor costs.

The line described is for 11 kV working and is designed to the Overhead Line Regulations, EIC53 (1947 revise) for wind and ice loading, but the steel work is unearthed. The conductors are 0·1 sq in. eq. (7/0·183 in.) Silmalec aluminium alloy. A higher factor of safety is adopted for basic conductor erection design as it is considered that if the minimum factor of safety of 2 is used, vibration troubles might result. A factor of safety of 2·2 is, therefore, adopted giving a worst load tension under wind and ice conditions at 22° F of 3,445 lb per conductor.

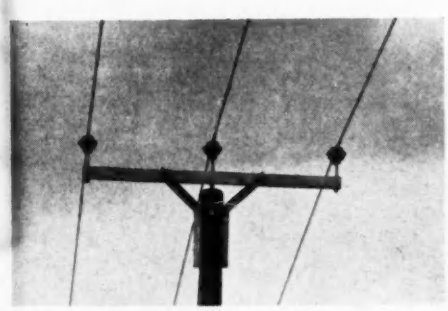

Fig. 1. Intermediate pole using pin insulators

It will be appreciated that if copper conductors are used with this design the span lengths can be increased over those of normal earthed construction for normal pole diameters and, consequently, the number of supports per mile can be reduced. Aluminium alloy conductors constitute a saving in initial cost, but these have larger diameters than equivalent copper conductors and this neutralises any reduction in the number of supports referred to for copper. The adoption of horizontal conductor formation and the use of the extended pole top bracket reduces the average pole height by about 4 ft compared with earthed construction.

The behaviour of overhead lines of unearthed construction to B.S. 1320:1946 has been satisfactory and considerable lengths are in service at higher voltages with good results. There is no reason to doubt that the performance of the lines described will not be as good.

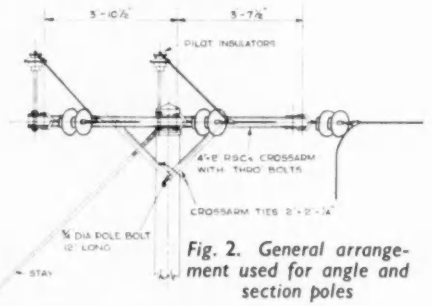

Fig. 2. General arrangement used for angle and section poles

Construction Details

Conductor Spacings. The spacings between phase wires in the horizontal plane is 3 ft 9 in.

Conductor Arrangements. The conductors are arranged in horizontal formation at all structures intermediate, angle, section and terminal. There is ample evidence that horizontal formations have advantages where dancing or galloping conductors are likely to be encountered or where the line may be subject to periodic ice loading and the conductors swing upwards due to ice shedding.

General Arrangements of Pole Tops. The general arrangement of the pole top for intermediate supports is shown in Fig. 4 and that for angle and section type poles in Fig. 2. At terminal positions a section type crossarm with additional reinforcement is used so that any extensions of the line can be carried out without any structural alterations to the terminal pole.

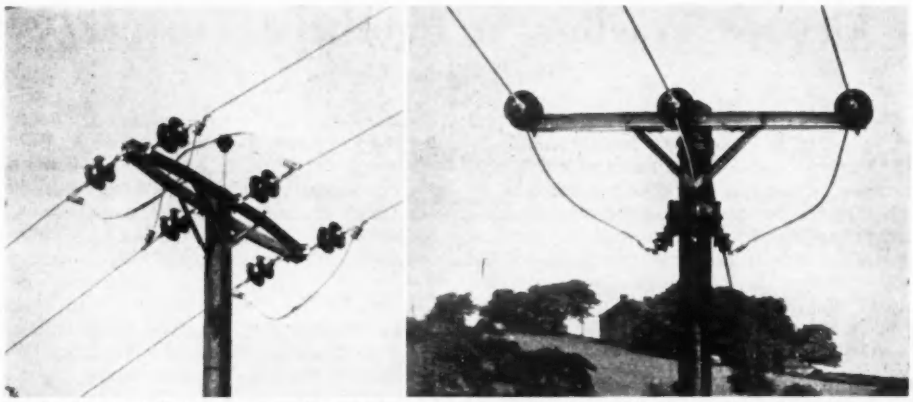

Fig. 3. On the left is seen a completed section pole top assembly, while the view on the right shows a terminal pole, with the cable box in evidence

An intermediate type pole with pin insulators is given in Fig. 1 while Fig. 3 illustrates a section type pole with tension insulators.

Pole Dimensions. The poles are of imported creosoted Baltic fir and the standard sizes given in B.S. Specification 139:1921 are used. The following are the dimensions of the poles :—

28 ft × 10½ in.	36 ft × 11½ in.
30 ft × 10¾ in.	38 ft × 11¾ in.
32 ft × 11 in.	40 ft × 12 in.
34 ft × 11¼ in.	42 ft × 12¼ in.

Stays. The stay wires are of 19/8 and 7/8, according to requirements. The stays are insulated with Permali stay insulators complete with arcing horns at all positions except terminal and special poles carrying air-break isolators. The stay rods are the tubular type of ¾ in. and 1 in. diameter.

Insulators and Spindles. The insulators are of brown glazed porcelain suitable for 11 kV working. The insulator spindles are the lead headed type and rated for 400 lb working load.

Span Lengths. The average span length, using 0·1 sq in. (7/0·136 in.) stranded copper conductors is of the order of 330 ft with a maximum span of the order of 340 ft. With aluminium alloys of the same equivalent area the average span length is of the order of 300 ft. On the line described, the profile was such that 300 ft could not be exceeded. Increased span lengths could be practiced with aluminium alloys but pole diameters must be fixed accordingly in order to withstand the increased lateral load due to increased windage.

Conductor Joints. All the conductor joints, both tension and non-tension, are nozzle type.

Fig. 3 shows a terminal pole complete with cable box. The connections to the cable box are made with bi-metal connectors to prevent danger of interaction between the aluminium alloy and copper terminations of the cable box.

There is one point I would like to stress in the erection of aluminium or aluminium alloy conductors. If the draw tongs or come-along clamps have been used previously on copper conductors, see that these are cleaned before use with aluminium conductors. If this is not done, particles of copper will be forced into the surface aluminium and can initiate trouble.

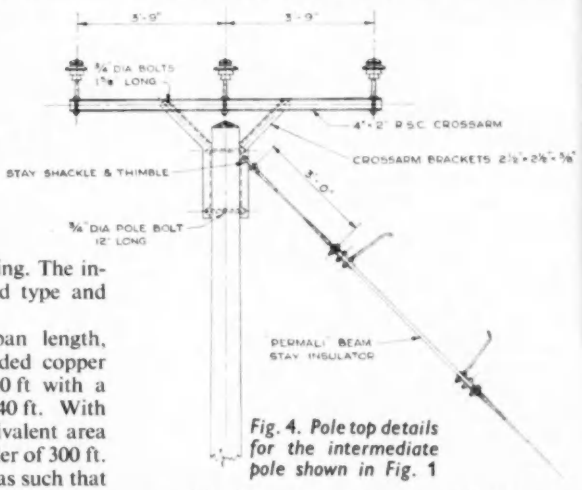

Fig. 4. Pole top details for the intermediate pole shown in Fig. 1

The author wishes to express his thanks to the Yorkshire Electricity Board for permission to publish data and drawings.

Electric Traction at Industrial Frequency

(From a Correspondent)

AT the present time the world's electrified railway mileage is divided about equally between direct current and alternating current systems. Both types of supply involve either generating power specifically for railway requirements, or converting the power received from the industrial distribution network. On d.c. railways this conversion obviously takes the form of rectification. The need for converting the supply to a single-phase a.c. railway, otherwise than by transforming down the voltage, is less apparent. It arises from the commutation difficulties with series traction motors operated at the usual industrial supply frequency of 50 cycles, due to the high voltages induced in the armature windings by the pulsating flux. Quite early in the development of electric traction it was decided that the best way round this problem was to employ a lower frequency, usually 16⅔ or 25 cycles.

In countries with abundant water power it was not a serious drawback for railways to have to generate their own low-frequency supplies, although with the spread of industrial power distribution it has become difficult to justify a "grid" and a self-contained railway network existing side by side. To convert a 50-cycle supply to a lower frequency it is still normally necessary to use rotary machines, so that often it has been preferred to make the conversion into d.c. with static rectifiers.

50-cycle Traction

On the other hand, the prospect of using 50-cycle current for traction has continued to attract railway engineers. Substations may then be simple transformer sites, possibly requiring only very short feeders from a nearby h.v. cable route. The contact line voltage may be high, resulting in a light and relatively cheap overhead system on the railway itself. The traction engineer is then offered the alternatives of transforming the supply down in the locomotive or motor coach for application to the motors, still at 50 cycles; or of equipping his rolling stock with rectifiers or rotary converters and using d.c. motors for propulsion. Recent developments make all these possibilities considerably more attractive than they were in the early days of electric railways.

Experiments with 50-cycle single-phase traction begun in 1936 on the Hollental line of the German State Railway, were taken further by French engineers when the line came into the French Zone of Occupation after the recent war. In 1950 the French National Railways converted their branch from Aix-les-Bains to Annecy for operation at 20,000 V, 50 cycles, and later extended the conversion to La Roche-sur-Foron. Traffic has been worked by a 4,000 h.p. locomotive with 50-cycle motors.

Other experiments

The French experiments are being watched with great interest by electrical and railway engineers in other parts of the world, notably in the United States, where Westinghouse have equipped a Pennsylvania motor coach with ignitron rectifiers and d.c. traction motors for running on the 25-cycle a.c. system. Two mixed traffic locomotives similarly equipped are being built for the same railroad. Although the existing Pennsylvania electrification is at 25 cycles, the rectifier locomotives on a 50-cycle system is the goal of the experiments.

There will be opportunities for discussing all these approaches to the problem at the International Congress on Electric Traction to be opened under the auspices of the French National Railways at Annecy on October 12. It is significant of the French attitude to the future of 50-cycle traction that their prototype locomotives (apart from the latest rectifier design) all make provision for alternative running on 1,500 V d.c., although at reduced power. This would be necessary to facilitate working traffic at points where 50-cycle and d.c. lines connected, and suggests that a considerable area of 50-cycle operation is contemplated. In fact, the French Minister of Public Works and Transport announced that S.N.C.F., working with the German Railways are studying the electrification on the 50-cycle system of the 250 miles connecting Dunkirk with Lille, Aulnoye, Mezières and Thionville.

It is true that the French National Railways are continuing to develop main-line locomotives for 1,500 V d.c., but M. Marcel Garreau, Chief of the administration's Electric Traction Division, emphasised recently to an audience of British railwaymen that this work would also benefit future extensions of the 50-cycle system. At present, he said, it was only on the 1,500 V d.c. lines that the mechanical aspects of designing electric locomotives for high-speed service could be studied in operation and the data collected would be applicable to any future 50-cycle types for fast traffic.

Our readers' views . . .

Floating Power Units

AS it would appear from a letter you recently published, and from articles in the national Press, that B.E.A. engineers are attempting to claim all the credit for the suggested use of the above for public electricity supply service, I would like to remind all concerned that this suggestion was made in my letter published in the issue of your journal for January 2, 1947. Whilst I do not claim that the use of ships for power generation was an original suggestion, in so much as I had some knowledge and connection with the prospective use of barges for this purpose at the end of the 1914-1918 war, I believe my suggestion that large ships with generating plant be utilised to feed into the Grid system was original.

I would mention that before this suggestion was made, the whole matter was considered by experienced engineers, and whilst it was appreciated that there were some snags, careful consideration showed that these could be overcome. This policy was put forward as a short-term one which could allow of existing boiler plant in the ships and in some cases the existing prime movers to be utilised for generation purposes. The main objective was to obtain and install more generating plant *quickly* in localities where it was urgently required. It now appears that due to changed economic circumstances, and the possibility of a new world war with its risk of directed missiles, etc., that permanent floating generating stations could be utilised with advantage as a long-term policy.

With reference to the suggested use of heavy oil engine sets of 10 MW capacity and gas turbines, I would mention that I stressed the use of such plant in April, 1945.

This caused considerable interest in the Technical Press, and had some bearing on the many oil engines subsequently installed in factories, etc.

As an engineer with many years experience of heavy oil engines, and with one of the first gas turbines to be installed in this country, I consider that both these prime movers have a big future, especially the latter.

W. E. Jones

EWELL M.I.E.E.

Overseas Experiences

YOUR article "Wiring in Nigeria" in the issue dated Sept. 6, brought back memories to me of the many months spent in that Colony whilst serving with the Royal Engineers.

I first lived at Yaba, which is some five miles from Lagos, the College being in use as a military hospital.

When I arrived in 1943, the electrical distribution to W. D. Camps was of course entirely by overhead lines, but what amazed me was the method of suspension, the almost invariable solid drawn conductors were reeved through holes in the poles at the usual spacing and made off at the end of the run of perhaps six or eight spans by binding the conductor round the pole and back on itself, using *no* insulators anywhere beyond the service metering pole, at which point trouble had been experienced on wet days.

Although informed by the Public Works Department Engineer that leakage on the hundreds of poles throughout our camps was negligible, during the course of my tour I had most of them fitted with porcelain insulators. As can be easily understood, if one line broke anywhere on the run it simply shot back through the poles until it lost tension.

As most of the new hut roofs were "pan" (corrugated iron), I suggested the use of P.B.J. as a more suitable service line than the usual bare copper, only to be told that it looked like a string of bunting after a few months service. This snag was overcome by the use of "Pernax" cables which appeared to give every satisfaction.

Mention in your article of "lightning troubles prevalent in the tropics" calls to mind one day when I went "into" the roof of a bush thatched hut to investigate a fault; there I found the cores of a twin T.R.S. cable blown as far apart as they could go (three yards in one place) and stripped entirely of all insulation, the cores glistening brightly with their tinned surfaces showing never a sign of overheating.

I should like to take this opportunity to pay tribute to the many West Africans who, with hardly any engineering background, have that happy knack of "knowing how".

ASHTON-UNDER-LYNE *J. Bayley*

Load shedding on an Interconnected system

Dropping Frequency and voltage for load reduction purposes analysed by A. Salzmann, Dipl.Ing., A.M.I.E.E.

IT is well known that load shedding is required when demand exceeds capacity of generating plant, or when tie lines from stations which constitute a power reserve pool carry currents up to the limit of thermal capacity. In general, load shedding can be carried out by:

(*a*) Reduction in system frequency.
(*b*) Reduction in voltage.
(*c*) Disconnection of supply to consumers.

Taking (*a*) first, the drop in frequency caused by increased load above the capacity of the generating plant must be limited. If the load demand say in load area (*b*) (see Fig. 1) exceeds the plant capacity, assuming an open-circuited tie line, the frequency should in general not be permitted to fall below the level of 48 c/s.[1] This is because a frequency lower than 48 c/s may cause:

(1) Rapid reduction in output of generating sets.
(2) Damage to alternators.
(3) A slowing down of station auxiliary plant, with possibly complete loss of this equipment, if it is protected by relays responding to the rate of drop of frequency, and the latter fail to operate correctly.
(4) A slowing down of a.c. motors in the load areas.
(5) The interruption of electrical signalling circuits, where no frequency correction devices are provided.

Obviously, a fall in frequency due to increased load could be obviated by an increase in generation but in our case this is not possible as plant capacity lags behind demand. In fact this case represents automatic load shedding, as a drop in frequency reduces the active power demanded particularly by industrial loads. In the event of a further increase of load demand we have to resort to load shedding by reduction in voltage and finally, possibly by disconnection of supply to consumers.

A Simple Example

When utilising the reserve power of Station A, a transfer of power via the tie-line is needed to cover an increased demand on station B. The load relief from station A will then permit an increase in generation at B, and consequently will restore normal system frequency. However, a further increase of demand on station B will again cause a fall in frequency, and if no station reserve at A is then available, or if the tie-line carries currents beyond its thermal capacity, we have to resort to load shedding by methods (*b*) or (*c*) as described above in both load areas "a" and "b".

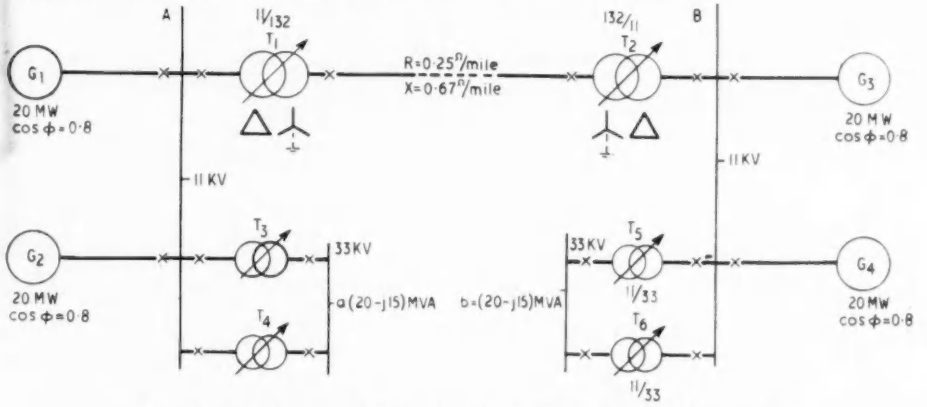

Fig. 1. Network assumed to be operating for the purposes of this article

Load relief by voltage reduction can be very effective, of course, within limits, if the voltage level prior to load shedding is satisfactory. In such cases the voltage in distribution networks can be reduced as much as 5 to 10% and the consumers' apparatus still continue to operate without disturbance. This applies particularly to static loads such as heating and lighting. For instance 5% voltage reduction decreases the demand of a resistive load by approximately $(95/100)^2$ or about 10%. With the industrial load, however, difficulties may arise, as a reduction in voltage is approximately compensated by an increase of current, which may result in the tripping out of single phase a.c. motors on overload, and induction motors may not be able to perform the required duty due to reduction in maximum torque or may not start if the voltage is reduced below a certain value.

It is obvious if the voltage level in the load area is low, load shedding by voltage reduction is limited and in some cases impossible. It will then be necessary to resort to the switching out of distribution feeders.

Disconnection of consumers will also be required if method (*a*) and (*b*) fail to bring the maximum demand within the capacity of the generating plant.

Tie-line Voltage Maintenance

In conjunction with load shedding by voltage reduction, a further problem which arises is the maintaining of a satisfactory voltage level on the h.t. tie-line between the generating stations. (See Fig. 1.)

High power-factor loads such as heavy heating, lighting and moderate industrial loads (say in load area "b") and consequent transfer of power from A to B at a high power factor may cause a small voltage drop on the transmission system. In this case there will be scope for load shedding by lowering the voltage at points in the load area "b" to a level sufficient to maintain satisfactory operation of the consumers' plant.

On the other hand, low power factor loads such as reduced static and constant industrial load say in load area "b" and the resultant transfer of power from A to B at a low power factor (assuming the capacity of the generating plant B lags behind the load demand) may cause an appreciable voltage drop on the tie-line when using the generating station reserve at A to meet the demand on B. This fact is well known, because most of the voltage drop in short transmission feeders is due to lagging current flowing through inductive lines. If the compensation of the transmission voltage drop is limited (assuming there are no synchronous condensers, no capacitors available in the load area and the step-up and step-down interconnector transformers equipped with load-ratio voltage control devices are operating with highest and lowest tap ratios) there is no scope for lowering the voltage level at points in load area "b".

We then have to resort to load shedding by switching-out distribution feeders, in order to bring the demand on station B within the capacity of that of the generating plants.

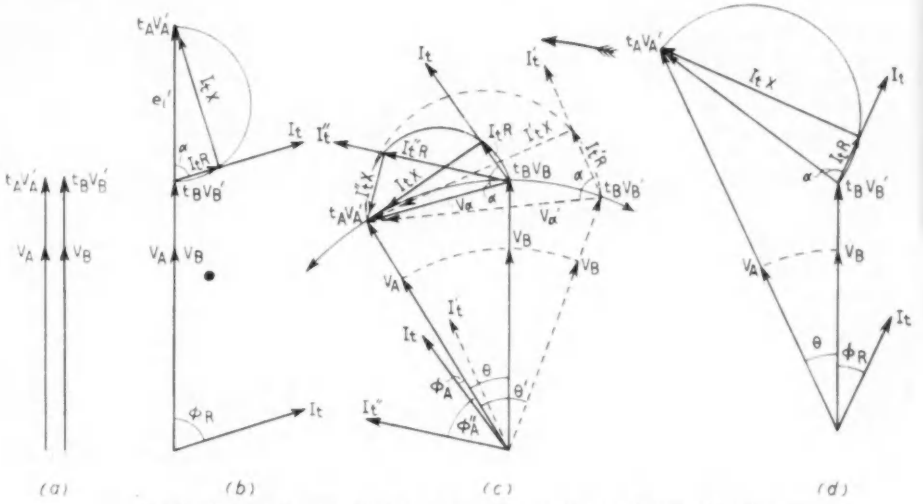

Fig. 2. Vector diagrams of the system under various conditions of loading

From the above it can be seen that the effectiveness of load shedding by voltage reduction is a function of the tie-line power factor, i.e. kilovar generation and transmission, and consequently of the normal system voltage drop.

In general, transmission of reactive power over tie lines of appreciable length should be avoided. The reactive power required for low power factor loads, say in load area "b," should be met either by generating all the kilovars in station B, so far as it is practically possible, or alternatively by employing corrective devices such as synchronous condensers, capacitors or alternators generating kilovars only.[2,3]

However, if transmission of kilovars, say from A to B, is unavoidable, the range of required voltage control with load-ratio control devices on the interconnecter transformers must be high. In this case the generating sets at B will need to be loaded to full capacity and operate with full excitation in order to generate all the reactive power without reducing the kW output, while station A exporting kilovars should operate with maximum excitation, but not exceeding the permissible busbar voltages or the voltage at the line winding of the step-up transformer. It is obvious that the kilovar transmission regulated by the load-ratio voltage control on the interconnecter transformers determines the voltage level on the tie line and consequently the voltage in the load area.

Fundamental Principle

Consider the hypothetical circuit shown in Fig. 1 with a short tie-line in which the effect of capacitance and conductance are negligible. The operating conditions of this transmission system are similar to those for two generators in parallel connected to busbars through an intermediate reactor, the latter representing the tie-line and on-load tap-changer step-up and step-down transformers with fixed ratio. Let us assume for the initial conditions that the interconnected power stations A and B have identical capacity, their alternators have equal governor and field settings and they supply identical load areas.

Under these conditions no power transmission takes place, because the busbar voltages V_A and V_B and the voltages at the line windings of the step-up and step-down transformers, $t_A V'_A$, $t_B V'_B$, the latter having identical ratios, are nearly equal in phase and magnitude, and each station supplies its local load. (See Fig. 2a, where t_A and t_B are factors expressed as a fraction of the nominal tap ratio and V'_A and V'_B are nominal voltages of the line windings of the transformers.) If the kilovar demand on station B is increased, but the kW demand reduced and the generating sets are not loaded to the full capacity, the reduction of the kW output of alternators G_3, G_4 may cover the increased kilovar demand. However, a further increase of reactive power demand on B will be met by the generating station reserve at A. This is achieved by maintaining the busbar voltages $V_A = V_B$ constant, adjusting the excitation of the generators, and boosting up the sending end voltage to $t_A V'_A$ by means of the load-ratio voltage control device on the step-up transformer. In general, the tie-line current I_t will lag the in-phase boost voltage $= (t_A V'_A - t_B V'_B)$ by nearly 90°, as shown in the vector diagram Fig. 2b, because the reactance component of the combined line and interconnecter transformers is usually considerably greater than the resistance component.

Thus the in-phase voltage e_t controls mainly kilovar transmission, as kW transfer is negligible. It should be born in mind that the angular phase displacement between the voltages $t_A V'_A$ and $t_B V'_B$ is, in fact, not quite zero, because station A has to provide some active power to cover line and transformer losses.

However, if the kW and kilovar loads, say in load area "b," are increased, assuming the generating sets G_3 and G_4 are fully loaded, the increased demand can be met by station A, if generating station reserve is available. This is accomplished by admitting more steam to the prime mover of G_1 and G_2. Increased steam supply to the turbines will accelerate the alternators, causing an angular increase in displacement of the rotors of the generating units at A and B, thus an advance in phase of the voltage V_A, related to the voltage V_B, will take place as illustrated in the vector diagram shown in Fig. 2c.

Active Power Transmission

With constant and equal busbar voltages at both ends, the latter being controlled by generator field adjustment only, and identical ratios of the interconnecter transformers, a voltage difference $(t_A V'_A - t_B V'_B)$ approximately, between the ends will be required to cause a current I_t to flow along this line. This current lags V_D by an angle $\alpha = \tan^{-1} X/R$, where X and R are the overall reactance and resistance of the interconnecter and transformers.

An inspection of this diagram shows that the resistive voltage drop component ($I_t R$) determines the phase angle at which power is transferred from A to B. Current I_t leads the

voltage $t_A V^1_A$ by an angle $\varnothing_A$ and the latter is a function of the combined line and transformer impedance angle α. A large resistance component as compared with the reactance, increases the power factor of the tie-line load and consequently the tie-line losses (Fig. 2c, angle $\varnothing_A{}^{11}$). It is thus obvious that the magnitude of the active power component of the tie-line load depends on the angular phase displacement between sending and receiving end voltage.

If additional load is thrown on the busbars of station B, units G_3, G_4 will slow down and the voltage at B will fall back in phase (see dotted lines in Fig. 2c). The angular displacement θ^1 between $t_A V^1_A$ and $t_B V^1_B$, the voltage difference $V_d{}^1$ and current I_t are increased and I_t is more in phase with $t_A V^1_A$. The result is that more steam is admitted to the prime movers for G_1 and G_2 if the operator at A alters the governor settings, thus power station A will send more power to B.

Load transfer, however, cannot be increased indefinitely as should angle θ exceed a critical value, the interconnected stations may fall out of step. It is, therefore, of vital importance to operate the system near its power limit to ensure stability.

It should, however, be emphasised that stability of interconnected generating stations is increased if the combined impedance of alternators, interconnecter transformers and tie-line is small, or transfer of power is carried out by expensive quadrature control in the interconnecter.

It will be observed (Fig. 2c) that transfer of power from A to B takes place at leading power factor and the magnitude of the latter depends on the voltage difference V_d and the impedance angle α. The current leads voltage $t_a V^1_a$ by an angle $\varnothing_A$ and station B imports power at a leading power factor, that is with leading kilovars. It is obvious that this reactive power cannot be utilised, since the requirement on B is usually for lagging reactive power. The alternators in station B must, therefore, generate in addition to the lagging kilovars to meet the local demand, lagging kilovars to cancel the leading reactive component. These conditions may lead to load shedding by disconnection of consumers, as the low power factor of the generators will require reduction of the kW output. Kilovar generation cannot be increased at will even at the expense of reduction of the kW output of the generating sets, since the range of excitation required for kilovar generation and maintaining busbar voltages at a certain level is limited. The most ideal conditions are accomplished by adjusting the power factor of transmission to a value that the imported kilovars can be used directly.

The control of a reactive power, i.e. the tie-line power factor, is, therefore, of vital importance. This is illustrated in Fig. 2d. The voltages $V_A = V_B$ on the busbars are maintained constant at all loads by means of excitation control and the sending and receiving end voltages $t^1_A V^1_A$, $t_B V^1_B$ are adjusted by means of the load-ratio control devices on the interconnected transformers. From this vector diagram it follows, that the in-phase boost voltage e^1_i controls kilovar transmission and that the resistive voltage drop component ($I_t R$) determines the phase angle $\varnothing$ of the tie-line. Thus, if a certain load at a given power factor, or in other words, a given reactive power, is to be dispatched from A to B, a voltage difference approximately ($t_A V^1_A$—$t_B V^1_B$) will be required, provided the combined tie-line and transformer impedances remain constant. Alternatively, for a given voltage difference and tie-line load a certain transfer of kilovars will take place.

Summing up

In conclusion, kW transfer depends on the magnitude of the sending and receiving end voltages and their angular phase displacement. Kilovar transfer is independent of the absolute values of sending and receiving end voltages and is a function of the equivalent tie-line impedance and the approximate voltage difference ($t^1_A V^1_A$—$t_B V^1_B$) provided the impedance angle α is large. (Resistance very small compared with the reactance.)

It must be emphasised that kW overloading of generators is possible, of course, within the range of the permissible temperature. On the other hand, increased reactive power (low power factor) exceeding the MVA rating, or even within the MVA rating of the alternators, is limited by heating of the field and range of excitation required to maintain constant busbar voltages at any load. Thus generation of reactive power can be increased only if the alternators are under-loaded, and there is some field margin left to maintain constant busbar voltages.[4]

Take the case when the reactive power demand on station B is substantially increased, assuming the generating sets are working with full excitation and no station reserve at A is available, there is no other course left than load shedding, possible by disconnection of the supply to some consumers. The subsequent reduction of the MW output of the generating sets will enable them to increase kilovar output,

and provide some field margin for busbar voltage regulation. A further increase, say, of active power demand on station B will cause a drop in frequency, and consequently automatic load shedding. A fall in frequency below the level 48 c/s should be avoided and we will have to resort to load shedding, possibly in both load areas "a" and "b." Switching out some distribution feeder will bring the required load relief.

Finally, it is of vital importance that the receiving end voltage is under control of an operator, in order to maintain fixed busbar voltages at nominal voltage, say, 11 kV, at any load conditions. Variation of the voltage of the incoming feeder related to the busbar voltages may cause a wattless circulating current between T_2 and G_3 and G_4 and consequently a redistribution of kilovars.

With a voltage level of, say, 11 kV, on the busbars at any load conditions, we will have scope for load relief by voltage reduction. This is achieved by load ratio voltage control devices on transformers T_3, T_4, T_5 and T_6.

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What the ELECTRICITY REGULATIONS *mean*

WHEN regulations "for the generation, transformation, distribution and use of electrical energy in premises under the factory and workshops acts" were first issued in 1909, the need for some elucidation of the intention behind their legal phraseology was soon felt by those responsible for the installations they affected. H.M. Senior Electrical Inspector of Factories accordingly obliged with a memorandum on the regulations which, as Form 928, has become familiar to many factory and supply engineers.

Revision of this document has taken place from time to time, but the most recent version bore the date 1924 until last week a fourth edition was issued by the Stationery Office, price 3s. It is to summarise for those familiar with the older work the changes to be found in the more satisfying and up-to-date commentary that is now offered, that the tables in the following pages have been prepared.

New Legislation

In general, there has been no change in the regulations since the third edition of the memorandum was prepared, though a drafting amendment of Regulation 18 has been introduced to remove a difficulty of intepretation to which attention had been called in High Court proceedings. What has happened is that, consequent to the Factories Act of 1937, the regulations now cover a wider field, the necessary extension having been laid down in the Electricity (Factories Act) Special Regulations, 1944. Thus now the regulations apply to factories, to all electrical stations, to warehouses, docks, etc., to ships when worked in dock, to building operations, to works of engineering construction, and to certain institutions.

Appendices to the memorandum comprise a note on low voltage and medium voltage switchboards, the 1947 Electricity Commissioners' regulations for overhead lines and a discussion of the performance of apparatus under short circuit conditions. This last is a new addition, and is included because of the rapid increase in short circuit MVA values on most electricity systems in recent years. Regulations 1, 5 and 8 in particular demand a knowledge of the fault MVA to which an installation may be subjected, and the appendix suggests methods of calculation.

In concluding this review of the new memorandum, it must be emphasised that the tables on the following pages refer to changes only: no summary has been attempted of the memorandum in full. Moreover, the subject matter of the various regulations and exemptions has been indicated only briefly, to enable those familiar with the regulations to comprehend which particular one is in question.

REGULATION	CHANGES FROM THIRD EDITION
Exemption 1. Certain regulations do not apply to low-pressure systems.	A 440 V 4-wire system in a public supply generating station is now regarded as qualifying for exemption from the specified regulations, since the phase to neutral pressure is 250 V. The statement that the exemption is not intended to apply to a.c. circuits of auxiliaries has been removed in the present edition.
Exemption 2. Regulations do not apply to lines and apparatus on supply side of consumer's terminals.	A note has been added on the special problem that arises when inflammable conditions exist, and the consumer uses flameproof gear. Although the exemption applies no conditions for service gear, other than the absence of live metal, it is considered desirable that the arrangement, enclosure and disposition of apparatus should be consistent with that of the consumer's installation.
Exemption 3. Regulations not to apply when there is no danger.	No change.
Exemption 4. Regulations not to apply to process or apparatus for electro-chemical, electro-thermal, testing or research purposes.	This section of the memorandum has been greatly extended and rewritten. A note has been added emphasising that the exemption applies only to processes and apparatus used exclusively for the purposes named. Electro deposition of dust or liquids by ionisation is not regarded as coming within the exemption as "electro-chemical." For h.f. heating, it is recommended that all working platforms should be insulated to provide an earth-free area. Insulated tools, protective screening, interlocks and earth leakage devices to detect incipient breakdown are also recommended. Interlocked enclosures are recommended for the case of dielectric heating and for all h.f. generators. The danger of stray fields setting up heating in metal objects is emphasised. Where infra-red heating is used for paint drying, interlocking of electric fans and conveyors with heaters is recommended to avoid dangerous concentrations of vapour. Test areas should have signalling lamps in duplicate to avoid incorrect indication due to defective lamp filaments. Where possible, in test shops an earth-free supply to an earth-free area should be arranged. Flashing high voltage conductors to indicate that they are alive is condemned as dangerous. Where possible, one pole of h.v. test circuits should be earthed, and its terminal conspicuously marked.
Exemption 5. Special orders.	No change.
Exemption 6. Special exemptions.	No change.
Exemption 7. Domestic factories and workshops exempted.	Exemption rendered of no effect by changes in 1937 Factory Act.
Exemption 8. Exempts certain works of construction etc.	New exemption added by 1944 Special Regulations.
Regulation 1. Apparatus and conductors to be of sufficient size and power and so installed, maintained, etc., as to prevent danger.	New emphasis on fact that "sufficient in size and power" implies capability of safely withstanding the electro-thermal and electromagnetic effects of any short-circuit that may occur. In regard to "construction and maintenance," regard must be given to conditions of use. "Maintenance," it is emphasised, implies routine examination and, where necessary, test. This applies especially to switchgear and transformer oil.

Regulation	Changes from third edition
Regulation 2. All conductors to be insulated, protected, placed and safeguarded to avoid danger.	The availability of new materials has caused many changes to be made in this section. Insulated conduit is approved where the risk of damage is small. Cleated t.r.s. should only be used if building maintenance operations will not interfere with it. The need for considering atmospheric conditions is emphasised and p.v.c. or synthetic rubber is recommended for some applications. Where flexible cables are used, the application of stout rubber tubing as additional protection to the cable at the point of entry to portable apparatus is noted as advantageous. Flexible cables connected to pendant lamp fittings may need heat-resisting insulation.
Regulation 3. Requirements concerning switches, switch-fuses, circuit-breakers and isolating links.	Manually operated circuit-breakers should be of the loose handle type. Such c.b.s should have reliable "on" and "off" indication. "Maintaining good contact" is stated to imply that the blades of a switch or switch-fuse must be prevented from unintentionally moving when in the "on" position, e.g. during a short-circuit.
Regulation 4. Switches and circuit-breakers to break properly on all poles.	All switches and c.b.s are required to have sufficiently strong bias towards the open position to ensure that they cannot remain partially closed.
Regulation 5. Fuses and automatic c.b.s to interrupt circuit before current becomes dangerous, and to operate safely.	In a new introductory paragraph the importance of action under short-circuit conditions is emphasised. H.R.C. cartridge-type fuses are recommended. It is suggested that circuit-breakers for use where the short-circuit rating exceeds 10,000 amps or 150 MVA should not be directly hand operated.
Regulation 6. Joints and connections to be of proper construction.	It is emphasised that every joint and connection should have the same properties, in regard to conductivity, insulation, mechanical strength and protection, as those of the system of which they form part. Where flexible cables are concerned, the use of a lampholder plug with a lampholder does not constitute a satisfactory method of connection. It is recommended that all conduit and metal sheathing should be tested periodically for conductivity.
Regulation 7. Efficient means of isolation to be provided.	Additional emphasis is placed on this regulation with respect to bare trolley conductors. Switches which can be locked in the "off" position should be arranged with obvious relationship to the associated conductors. On long runs, trolley wires may need to be sub-divided for the purpose of isolation.
Regulation 8. Protection against excess current required in every part of the circuit.	This section has been greatly extended. In general, the setting of circuit-breakers and fuses at the lowest currents possible, and the incorporation of earth fault protection to ensure operation at minimum current, is suggested. The importance in this of the nature and efficiency of the earthing system is underlined. The earth path resistance should be known. Current rating of circuit-breakers and fuses should be closely related to the rating of the cables and apparatus protected. Where earth electrode resistances are high, earth leakage circuit-breakers should be considered. On machine tools, etc., fitted with more than one motor, excess current protection should generally be provided for each motor. Sub-circuits supplying voltmeters and other instruments should be fused. Where time delays are introduced into protective gear, the probable dangers consequent on excessive temperature rise in protected apparatus should be carefully considered.

REGULATION	CHANGES FROM THIRD EDITION
Regulation 9. No single-pole switch in neutral.	Application of this regulation to such multi-contact switches as motor starters is the subject of comment. If it is not followed, and the starter is connected in an earthed conductor, an earth fault may cause starting though the control is in the "off" position. Permission to use a switch, etc., in the generating station earth, for testing purposes, introduces dangers which are emphasised.
Regulation 10. Switches where bare conductors are used.	No change.
Regulation 11. Protection for motors, convertors and transformers.	Where a main switch is incorporated in the starting panel, it should be placed in a compartment separate from the rest of the equipment, or the incoming line contacts of the switch should be efficiently protected to guard against inadvertent contact. For cranes and large machine tools, one switch can act for all the motor control apparatus; otherwise a separate switch is required for each motor.
Regulation 12. Starters to be provided for all electric motors, and means of stopping all driven machines.	Where large machines need several operators at different points, means of stopping should be provided at all positions. When a machine has been stopped, there should be some protection against its being accidentally restarted.
Regulation 13. Requirements for apparatus connected by flexible wires.	A note has been added that the provision of a short length of stout rubber tubing at the plug, enclosing the flexibles, gives useful additional protection against excessive bending of the cable. Hand-lamps should be provided with efficient cable grips. For use inside boilers, etc., low voltage lamps (25 or 12 V) are recommended. In connection with the maintenance of portable tools, the earth cores of flexibles and associated earth connections should be tested by passing a substantial current through them.
Regulation 14. Requirements for switchboard construction.	Distribution fuseboards are noted as being switch boards for the purposes of the regulations, and so they must have proper accessibility. In general, all apparatus requiring to be handled on any switchboard should be placed on the front of the board. Where labels are used for cable identification purposes on switchboards, it is suggested that they should be metal or insulating board with the lettering stamped on. Where switchboards are operated by remote control, the control wiring should be kept entirely separate from the main cables.
Regulation 15. Restrictions on switchboards having bare conductors.	It is noted that even if the switchgear is enclosed, under Regulation 30 access by unauthorised persons is still prohibited.
Regulation 16. Switchboard apparatus.	No change.
Regulation 17. Passageways at switchboards.	No change.
Regulation 18. Requirements for switchboards working at high pressure or extra high pressure.	Notes have been added on the locking of shutters, doors and screens over live conductors. Where switches are remotely operated, it may be necessary to earth the main frame of the switch as well as the handle, as required by the regulation, as joints in the mechanical linkage cannot be relied upon for earth continuity. Paragraph (d) of the regulations has been redrafted since the third edition, and the comments have thus had to be rewritten. Notes have been added on the isolation of sections of the switchboard to allow work to be carried out.

Regulation	Changes from third edition
Regulation 19. Parts of apparatus at high pressure or extra high pressure to be protected.	The terminals of transformers in transformer chambers must be protected if the chambers are used as store or cloak rooms. Special attention must be given to the case where there is more than one transformer or rectifier in an enclosure.
Regulation 20. Precautions against contact of high and low voltage circuits of a transformer.	The provision of a potential operated relay between l.v. winding and earth is added to the methods of protection suggested. Permanent connection of the low voltage system to earth is suggested as the best method of complying with the regulation.
Regulation 21. Earthing of metal required.	Electronic equipment is noted as an instance where earthing may not be a practical method of preventing metal becoming charged. New notes on earthing have been added, and the importance of knowing the earth loop resistance is emphasised. Fusing times at minimum fusing current are discussed in this connection. Earth leakage protection is recommended for use in some circumstances. Notes are included on the connection of conduit and stranded cables to casings for earthing purposes.
Regulation 22. Protection of conductors, etc., during work on them.	Earthing of conductors as well as isolation may be necessary in some cases where inductive charging is possible.
Regulation 23. Insulating stands or screens.	No change.
Regulation 24. Insulating stands, screens, boots, gloves, etc.	Repairs to insulating gloves and boots are noted as being inadvisable. Such gear should be replaced on showing signs of damage or deterioration.
Regulation 25. Adequate working space to be provided for all apparatus.	Examples of special circumstances are given. It is noted that attention and adjustments to live parts of electrical machines should be given when the machine is not energised.
Regulation 26. Adequate lighting required where there is electrical apparatus.	In electrical stations some stand-by means of lighting should be provided. Lighting circuits should in all cases be kept separate from power circuits.
Regulation 27. Conductors and apparatus exposed to wet and corrosive conditions.	This section has been rewritten and greatly extended. Notes are now included on the types of apparatus necessary where there is exposure to the weather, wet, corrosion, inflammable surroundings or explosive atmosphere.
Regulation 28. Authorised or competent persons for certain work.	No change.
Regulation 29. Instructions for treatment of electric shock to be exhibited.	The desirability of instructing all persons who are exposed to the risk of electric shock, on the steps to be taken should a mishap arise, is emphasised.
Regulation 30. Substations to be substantially constructed.	This section has been greatly extended. Substations should be constructed and arranged to minimise the effects of explosion and fire which might possibly occur.
Regulation 31. Substations to be controlled by an authorised person.	The authorised person must be appointed by the occupier, but when a supply authority substation is on consumer's premises, then the supply authority may have to secure a competent person.
Regulation 32. Underground substations.	No change.

Small Motors–

No. 2. COMMUTATOR MOTORS

A review of the characteristics, construction and application of these f.h.p. machines

by J. L. WATTS, A.M.I.E.E.

THE series motor with its armature and field windings connected in series with each other, is a very common fractional horse power motor, particularly for portable machines. It can be run at a high speed, 4,000 to 10,000 r.p.m. being common, whilst motors of 20,000 r.p.m. are also available. The motor is usually made with a completely laminated field iron system and designed for use on either a.c. or d.c., which is an advantage for many portable machines. Such motors have a high efficiency and power factor, whilst the starting torque may be 200 to 500 per cent of full load torque when started by the usual direct-on-line switching. The high speed of the motor is a desirable feature for portable machines as it enables a high ratio of power/weight to be obtained, though it may be necessary to employ speed reduction gearing to provide the correct speed at the driven apparatus.

Speed Characteristics

As shown in Fig. 1 the speed of the universal motor varies considerably on a varying load, and may be slightly greater on d.c. than a.c. In cases where it is necessary that the motor should run at the same speed on a.c. as on d.c., it is possible to ensure this by connecting a resistance in series with the motor, this being marked with suitable tappings for d.c. and a.c. and also, if necessary, for various voltages and frequencies. Another method is to use field windings which have tappings so that fewer turns can be used in circuit on a.c. than on d.c. A third method is to use a resistance in series with the motor, a portion of this resistance being connected in parallel with a capacitor. On d.c. no current flows through the capacitor, hence the parallel portion of the resistance carries the full motor current and has maximum volt drop. On a.c. the capacitor carries part of the motor current, the volt drop across the resistance in parallel with the capacitor is reduced, thus an increased voltage is applied to the armature to maintain the motor speed.

Commutation of a series motor is generally rather poor on a.c. although it may be fairly satisfactory on d.c. This is largely due to the fact that, at the instant when the armature coils are short circuited by the brushes during commutation, they are then being linked with a strong magnetic field from the field magnets, so

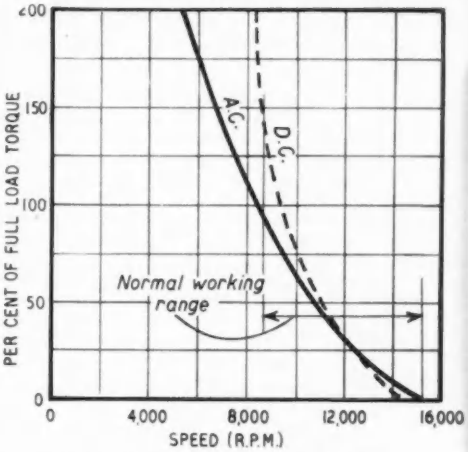


Fig. 1. Speed-torque curve showing the characteristics of a small universal motor

that a high value of circulating current flows through the commutated coils and brushes. The correct grade of brush is an important factor in limiting this circulating current and resultant sparking. In other cases the brushes may be moved slightly from the neutral position so that a neutralising field acts on the short circuited coils; if the brushes are fixed this displacement is often obtained by suitable connection of the armature coils to the commutator segments.

In some motors the field magnets, instead of having shaped (salient, or concentrated) poles as in a d.c. motor, have a distributed field winding which is fitted in slots similar to the stator of a single-phase induction motor with concentric winding. A compensating winding also may be fitted in the slots of such a motor, this winding being connected in series with the main field winding and arranged to create a compensating field midway between the main

field poles. The purpose of the compensating winding is to neutralise the magnetic field of the armature in order to promote good commutation and high efficiency. Since the armature reaction field is the main factor which causes the universal motor to operate slightly differently on a.c. than d.c. the compensated motor has practically the same performance on a.c. as on d.c.

Speed Control Governors

Series motors are unsuitable for use on a drive which may become unloaded, as may occur should a driving belt break or slip off its pulleys, because the motor speed may then rise to such a high value that the rotating parts may be damaged by the high centrifugal stresses created, such stresses being proportional to (speed)^2. In most cases, however, the friction of gearing or the windage of a fan on the motor shaft are sufficient to limit the speed of the motor to a safe value when there is no external load.

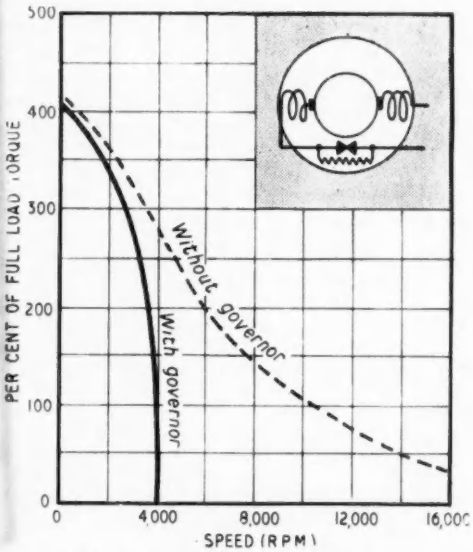


Fig. 2. Characteristics of a small governor-controlled universal motor

In some cases it is necessary or desirable that the speed of the motor shall be fairly constant, irrespective of the load. One method of obtaining this result is by the use of a mechanical governor which consists of a brake operated by centrifugal force acting on weighted arms, on the same system as in many clockwork toy motors. An increase of motor speed caused by a reduction of external load then results in the centrifugal device applying the brake so as to keep the total load and the motor speed within 0·5 to 1 per cent of the required value.

Electrical governors are also fitted on some motors; in these machines a centrifugally operated governor is used to separate contacts if the motor speed exceeds a certain value due to reduction of load or otherwise. The contacts may be connected in series with the motor; in other cases a resistance may be connected across the contacts as shown in Fig. 2. A capacitor is often connected across the contacts as well in order to avoid radio interference and to protect the contacts from destructive sparking. In practice the contacts may open and close several hundreds of times per second. Some governors can be adjusted for speed under working conditions, whilst others can only be adjusted whilst the motor is at rest. Fig. 2 shows that governor-controlled motors will run at a practically constant speed over a wide range of load.

Reversing and Variable Speed

The series motor can be reversed by reversing the connections to either the field coils or the armature, or by moving the brushes round through approximately one pole pitch. In a small series motor it is common to connect the armature between the two sets of field coils; the simplest way of reversing this motor is by reversing the connections to the brushes. If compensating windings are fitted the connections to these windings should be reversed if the motor is reversed by reversal of the armature connections. In the case of a plain series motor the commutation may be adversely affected after reversing the motor by reversal of the armature or field connections, unless it is possible to move the brushes slightly to provide the correct neutralising field.

The speed of a series motor can be reduced by connecting a resistance in series with the motor. In this case the safe full load torque will be practically constant and the safe full load horse power proportional to the speed. This method of speed control is inefficient, and also increases the variation of speed from no load to full load. Another method of reducing the speed is by connecting a resistance across the armature; this system gives a higher starting torque and better speed control than does a series resistance, but the value of the parallel resistance should be great enough to prevent overheating of the series field coils.

In the repulsion type of motor the torque is created by reaction between the magnetic field created by the current in the stator windings

and the current which is induced in the rotor conductors. In addition to the plain repulsion motor there are repulsion-induction motors and repulsion-start induction motors.

The plain repulsion motor has a laminated stator core, similar to that of an induction motor, with windings which are arranged for connection to the single-phase mains. The armature windings are of the d.c. type and connected to a commutator, which may be of the radial type. The brushes, however, are short circuited together and usually the brush-gear is not insulated from the frame of the motor.

Repulsion Motor Characteristics

This motor has somewhat similar characteristics to a series motor in that it develops a high starting torque and its speed varies considerably on a varying load, as indicated in Fig. 3. The

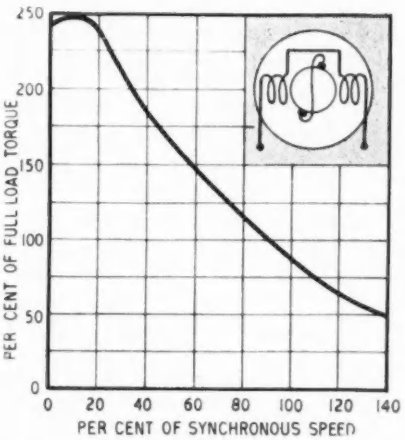


Fig. 3. Characteristics of a repulsion motor

working speed is normally between 50 and 150 per cent of synchronous speed. The motor is suitable for many of the drives for which universal motors are employed although, of course, it can only be used on a.c. It is used for drives such as fans, its construction being slightly cheaper and its commutation slightly better than that of the universal motor. The repulsion motor, however, has a rather low efficiency and power factor. A peculiarity of this motor is that it can be reversed and its speed controlled by slight movement of the brush rocker. This feature makes the motor a very convenient machine for certain purposes, such as testing; variable speed motors usually having the brush-gear coupled to an external lever for ease of speed control. On a given brush position the speed ratio from no load to full load may be 2 to 2½ to 1.

Repulsion motors are also obtainable which are specially wound so that they can be reversed by switching operation. One type of reversible repulsion motor has two sets of brushes, each set being fixed for one particular direction of

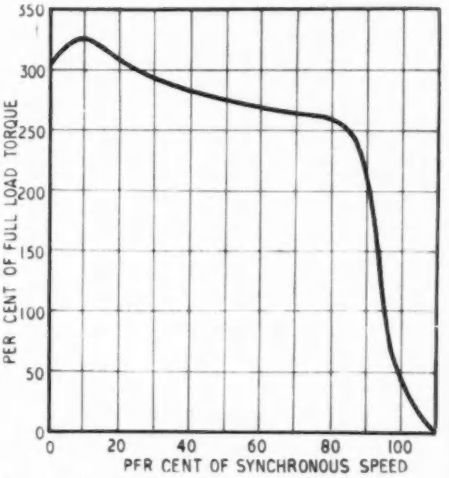


Fig. 4. Speed-torque curve for a typical repulsion-induction motor

rotation; a double-pole two-way switch may then be used to short circuit whichever section is necessary to give the required direction of rotation. Another type of reversible repulsion motor has two sets of stator windings, an inducing winding and a main winding which are connected in series with each other. Such a motor can be reversed by reversing the connections to either the main or the inducing windings, without brush movement. Repulsion motors can be plugged, i.e. switched into reverse whilst running at full speed.

The Repulsion-Induction Motor

The construction of the repulsion-induction motor is similar to that of the plain repulsion motor, but the rotor has an additional squirrel-cage winding in slots below the insulated d.c. type of rotor winding. The motor torque is due to the reaction between the stator magnetic flux and the current in the two sets on rotor conductors. The insulated winding has most effect at starting because the magnetic flux linked with the rotor then has maximum (synchronous) frequency, thus creating a high reactance in the inner cage winding which limits the current in this winding. The effect of this cage winding

increases as the motor accelerates from rest; as a result the motor has the high starting torque of the repulsion motor, whilst at the same time it has the fairly constant running speed of a squirrel-cage induction motor.

The characteristics of this motor depend on the design of the windings, the speed-torque curve of a typical motor being shown in Fig. 4. It will be noted that the motor may develop about one third of its full load torque at synchronous speed, at which speed the current and torque of the squirrel-cage winding are zero because the squirrel-cage conductors are then revolving at the same speed as the stator magnetic field. At synchronous speed the repulsion winding thus creates the whole of the motor torque. At lower speeds the squirrel-

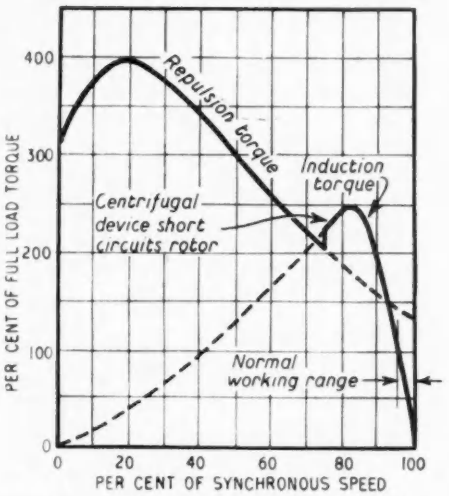


Fig. 5. Speed-torque characteristics for a repulsion start motor

cage winding creates a torque which assists that of the repulsion winding. It is a peculiarity of the repulsion-induction motor that it runs at slightly more than synchronous speed on no load. Above synchronous speed the current in the squirrel-cage winding develops a negative or braking torque which limits the no load speed. Due to these opposing torques it is possible that the repulsion-induction motor may run at a higher temperature on no load than on full load. The motor has a relatively low power factor and efficiency.

The usual repulsion-induction motor can be reversed by brush movement. Repulsion-induction motors can also be wound for reversible operation by switching without brush movement; such motors are very suitable for plugging into reverse and for drives such as lathes, screwing machines, which require a fairly constant speed on a varying load. This motor is, however, unsuitable for variable speed drives.

Repulsion-Start I.M.

The repulsion-start induction motor is probably the most common type of repulsion motor which utilises the repulsion principle. Its construction is similar to that of the plain repulsion motor, but the rotor carries an additional device consisting of weighted arms, balls, or other parts, which are thrown outwards by centrifugal force when the motor has accelerated to about 75 per cent of synchronous speed at starting. This centrifugal device then short circuits the commutator so that the motor continues to run as an induction motor with short circuited rotor winding. In many motors the centrifugal device also lifts the brushes from the commutator after short circuiting the latter. This arrangement minimises wear of the commutator and brushes, but may allow starting troubles to occur if the brushgear is allowed to stick due to dirt or other cause.

Characteristics

As indicated in Fig. 5 the motor has a high starting torque. One design develops a starting torque of 300 to 400% of full load torque, a run-up torque of 200 to 220% of full load torque, with 300 to 400% of full load current. Still higher torques are obtainable in some machines. The fall of speed from no load to full load is in the region of 5% of full load speed; thus this motor will serve to drive refrigerators, compressors, pumps, etc., requiring a high starting torque and a fairly constant speed.

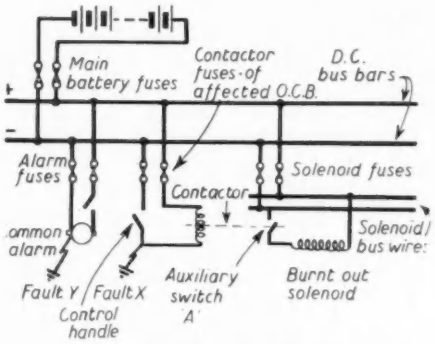
Reversal of the normal type of repulsion-start motor may be effected by slight movement of the brushes through a given angle, whilst motors which have specially-wound stators may be reversed by switching operation without alteration of brush position. It should be noted that the repulsion-start-induction motor can only be reversed when starting from rest or when running at low speed with the short circuiting contacts clear of the commutator; hence this motor is not suitable for plugging. It is not practicable to operate the motor at various speeds on a given supply, as the normal working speed is within about 5 per cent of synchronous speed. It should be noted that the starting torque may be seriously reduced, and the starting current may be increased, if the brushes are not in the correct position.

Problems and Practice

IN ENGINEERING

Earth Indication

THE following experience illustrates the importance of providing regular earth indication checks on batteries used for auxiliary operation of switchboards. A short time-rated closing solenoid on a feeder switch was found to be emitting smoke and the insulation was completely burnt out. On investigation the auxiliary switch A was found to be closed, two earth faults being located on v.i.r. cables, one in



Details of fault on battery switchboard

a tee box and one at entry to the alarm bell. These two faults caused the controller handle of the o.c.b. to be short circuited.

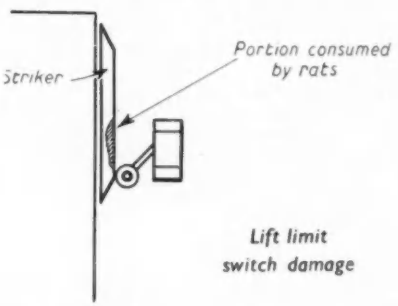
The resultant full load current on the solenoid coil had not only burnt it out but had damaged a cell connection to such an extent that the battery was incapable of supplying the tripping current for the circuit breakers, thus leaving the substation virtually without protection.—*Grad. I.E.E.*

Below Basement Level

WHILE serving my apprenticeship with a well-known lift engineering firm, I was directed to carry out a routine inspection of an electric goods lift which was situated in a food warehouse. On arriving at the premises to carry out the normal maintenance procedure, I was informed by the warehouseman that the operating buttons of the lift were causing trouble.

The cage of the lift was at basement level, and on entering I closed both outer and inner gates, thus making myself the sole operator. Having, on a former occasion, experienced similar trouble which had been due to swelling of the erinoid push buttons, I immediately pressed the down button to see if it was tight within its face plate. To my amazement, the lift instantly started in a downward direction, over-running on to the ultimate main limit, which was of a very old type operated by means of the balance weight striking a wooden ramp. This broke, and the cage came to rest at the bottom of the lift pit, with the machine still running and the ropes slipping within the V grooves.

On careful examination of the cage striker



Lift limit switch damage

which operates the limit switch, I found a large area was missing. The striker itself was made of an imported wood, from which the local rats had made a substantial meal; the resulting action being that when the lift approached the basement floor it was brought to rest by means of the striker engaging with the arm of the limit switch.

In this case, the time between the moment of the circuit being broken by the striker and the actual moment when the brake brought the lift to a stop was sufficient to allow the circuit switch arm to drop into the recess made by the rats, thus completing the control circuit and making the lift operative in both directions.—*Philip S. Hussey.*

Contributions to this page dealing with specific items of interest to electrical engineers and maintenance men are welcome, and, if accepted, will be paid for at our standard rates. Contributions should be written on one side of the paper only and may be accompanied by sketches, which will be re-drawn for publication.

Sir John Hacking

I.E.E. 1951-52 Session

Notes on the New President and

THE 1951-52 session of the Institution of Electrical Engineers commences within the next few days—the London opening date is October 11, but many local centres start earlier. For the guidance of readers we give some brief notes on the background of the new president and of the chairmen of the local centres. In all, these officials represent an excellent cross-section of the industry, there being members of supply, manufacturing, contracting, research, G.P.O. and the teaching profession. The president, Sir John Hacking, M.I.E.E., deputy chairman (operation) of the B.E.A., has had his finger on the pulse of the supply industry for many years—he was chief engineer to the C.E.B. from August, 1944, until his present appointment in 1947, having earlier been deputy chief engineer for ten years. He started in the industry back in 1908 with the Newcastle-on-Tyne Electric Supply Co., which he left in 1913 to spend 20 years with Merz and McLellan, first on important work abroad, mainly in connection with railway electrification, and subsequently to supervise construction of the grid in Mid-East and North-East England.

Turning to the Sections, the Measurements chairman, Mr. F. J. Lane, M.Sc., M.I.E.E., has been transmission design engineer to the B.E.A. since its formation. He, too, had extensive experience with the C.E.B., first as assistant technical engineer in the South-East England area, and later in charge of the system development section.

First of the research specialists is Dr. D. C. Espley, O.B.E., D.Eng., M.I.E.E., chairman of the Radio Section, who is in charge of telecommunications research in the G.E.C. Research Laboratories at Wembley, and chief engineer of the firm's Stanmore Laboratories. During the last war he was responsible for the development of several radar projects, and, more recently, he was in charge of the team of specialists who designed and installed the London-Birmingham T.V. relay link.

High-voltage research is the *forte* of Mr. R. Davis, M.Sc., M.I.E.E., chairman of the Supply Section, who is senior principal scientific officer in the National Physical Laboratory. For many years he has worked in co-operation with the E.R.A. on various problems. Serving in the Electrical Division of the N.P.L. since 1924, he has worked in the High-voltage Laboratory for about 20 years. It may be recalled that he delivered the Parsons Memorial Lecture on High-voltage Research in 1945.

Chairman of the Utilisation Section is Mr. A. H. Young, M.I.E.E., managing director of Edmundsons Electric Co., Ltd., and a director of its associated companies. Until nationalisation of the supply industry he was commercial manager of Edmundsons Electricity Corporation Ltd. and a director of 13 companies in the group. He now represents the I.E.E. on the Codes of Practice Committee, and is chairman of several of the Drafting Committees.

Turning to the local centres, Mr. E. W. Ashby, B.Sc.(Eng.), M.I.E.E., chairman of the Mersey and North Wales Centre, has been associated with that region for over 25 years. Now sales engineer attached to the Liverpool branch office of British Insulated Callender's Cables Ltd., he was apprenticed with a Bootle firm before joining Sandycroft Ltd., at Chester, eventually becoming chief of the Electrical and Mining Contracts Department there, and going to the Callender's Cable Co. in 1925.

Left to right: Mr. F. J. Lane, Dr. D. C. Espley, Mr. R. Davis, Mr. A. H. Young, and Mr. E. W. Ashby, with Mr. A. L. Ashton, top right

Chairmen of Sections and Local Centres

Another cable man, Mr. A. L. Ashton B.SC. (ENG.), M.I.E.E., joint manager of the Power Cables Department of Pirelli-General Cable Works Ltd., is chairman of the Southern Section. His connection with the company goes back to 1921. While serving in the Sales and Contract Departments, he supervised the first oil-filled cable contracts for the C.E.B. in the London areas.

Regional engineer in the Midland Region office of the G.P.O., Mr. W. H. Brent, B.SC., M.I.E.E., is chairman of the I.E.E.'s South Midland Centre. When he took up his duties at Birmingham during the war, one of his first jobs was to develop the rapid cabling of airfields, applying the mole-drainer technique. Recent work has included responsibility for equipping and lining up the city's co-axial system for T.V. and telephony.

A representative of the manufacturing side of the industry, Mr. P. Butler, B.SC., M.I.E.E., who is chairman of the Scottish Centre, has had a long association with the design and development of transformers, first with Metropolitan-Vickers and, since 1926, with Bruce Peebles and Co. With the latter company he has been chief transformer designer, and, since 1943, manager of the Transformer and Rectifier Depts.

The Western Centre has another member of the manufacturing industry as its chairman. He is Mr. J. W. Elliott, B.SC., M.I.E.E., who has been district office manager for the Edison Swan Electric Co. in South Wales for the past 30 years.

A well-known member of the teaching profession, Mr. A. W. Hirst, M.SC. (ENG.), M.I.E.E., head of the Electrical Engineering Department at Leicester College of Technology, is chairman of the East Midland Centre. He is author of a number of text books.

Chairman of the Northern Ireland Section is Mr. S. McCracken, M.I.E.E., assistant manager of the Metropolitan-Vickers Electrical Co.'s Belfast office. Sometime earlier he worked on the company's erection jobs in the East and in Western Siberia.

A specialist on electrical instruments and magnetic materials, Mr. G. R. Polgreen, M.B.E., B.SC. (ENG.), M.I.E.E., is chairman of the North-western Centre. He is chief engineer with Salford Electrical Instruments Ltd. and has been with G.E.C. for 26 years. During the war, *inter alia*, he was responsible for the design and operation of branch factories for making magnetic powder and cores, synthetic sapphires and quartz crystal units.

The North-eastern Section has for its chairman another transformer expert —Mr. E. C. Rippon, M.I.E.E., who has been chief transformer engineer with C. A. Parsons and Co. Ltd. since 1947, having been with the Transformer Department since 1931. He represents Great Britain on the International Study Committee on Transformers under the auspices of the C.I.G.R.E.

Finally, another representative of the teaching profession, Dr. E. C. Walton, PH.D., B.ENG., M.I.E.E., who has been for 18 years head of Electrical Engineering and Physics Department at the Leeds College of Technology, is chairman of the North Midland Centre. Earlier he had spent five years at the G.E.C. Wembley Research Laboratories.

Below: Mr. G. R. Polgreen, Mr. E. C. Rippon and Dr. E. C. Walton

Left to right: Mr. W. H. Brent, Mr. P. Butler, Mr. J. W. Elliott, Mr. A. W. Hirst and Mr. S. McCracken

overseas news

Bill for Tasmania

Appointment of a fourth commissioner and extension of the commission's overdraft will be the major features of the new Hydro-Electric Bill to come before the Tasmanian Parliament as a result of the Parliamentary committee's inquiry (which we noted last week). The Premier, Mr. Cosgrove, has said that the new commissioner would be an associate with engineering qualifications who would be able to co-operate with the Commissioner, Mr. A. W. Knight, in the planning of hydro-electric development and works. The bill would provide also for an extension of the overdraft of the commission from £10,000 to £500,000 to facilitate purchases of plant which came forward from time to time in connection with developmental projects. It would also give effect to the recommendation in the report for the creation of a committee to advise on priorities of hydro-electric works.

S.W. Power Scheme

Western Australia's new south-west power scheme would eventually bring power to 35 towns and settlements in an area of 1,800 square miles, the Minister for Electricity (Mr. Brand) declared at the official opening of the scheme at Collie recently, when the new power house was put into operation. More than 100 miles of line have been erected during the four years the Collie power station has been under reconstruction.

New Line for Victoria

The Victoria Government is to build an electric railway line between Frankston and Mornington. A recommendation adopted recently provides for an electrified line along a coastal route and a possible extension through Mornington to the south. The existing line will be demolished. The length of the coastal route is 8½ to 4½ miles shorter than the existing line. The estimated cost of the single-line electrified route is A£510,700, including A£106,000 for the permanent way; A£90,000 for clearing, earthworks, road diversions; A£76,000 for bridges and culverts; A£11,000 for stations; A£18,700 for electrification, signals, etc.

Expenditure Cut

The State Electricity Commission of Victoria and the Railways Department have been asked by the State Government to review their works programmes. The Commission had asked for £81 millions this financial year, while the railways proposed to spend £13,250,000. But the Commission is to get only £53 millions. It has been stated that as a result all work must cease on the Kiewa hydro electric project except on No. 4 power station. The chairman of the Railways Commissioners (Mr. R. G. Wishart) has said that some major works would have to be cut, including duplication and electrification of the Gippsland line, on which £2 million was to be spent this year.

Dumped Appliances?

Canadian appliance manufacturers allege that U.S. appliances such as refrigerators are being dumped on the Canadian market at near cost prices, according to a recent report. In 1950, Canada imported 406 U.S. refrigerators valued at $56,000. In the first six months of this year, with the barriers on U.S. imports removed, she imported 76,000 refrigerators worth $12,250,000, or an amount equal to more than half Canadian production in six months (based on local annual production of 300,000 refrigerators). Canadian firms making other appliances have also suffered severely, it is stated, their production plans for the fourth quarter of this year had to be cut by over 50% compared with the first quarter output.

Inter-Provincial Grid

The combination of the power systems of Manitoba, Ontario and Quebec into one vast interlocking grid system was predicted earlier this month by Dr. Otto Holden, general manager of engineering for the Hydro-Electric Power Commission of Ontario. He was speaking at Winnipeg at the Annual conference of the Institute of Public Administration. Dr. Holden is head of the Ontario technical committee that has been working with Manitoba officials to find some way of providing Manitoba with additional power from sites to be developed just east of the Manitoba boundary.

B.C. Expansion

Work in progress and a tentative expansion programme during the present fiscal year will require a $14,000,000 expenditure, the British Columbia Power Commission has announced. Various projects, now under construction or completed, will require about $3,300,000, and the fiscal year's programme, some of which remains to be submitted to the government for final approval, envisages new works totalling in excess of $11,000,000. Additional generating equipment is expected to cost more than $1,000,000 apart from new units for John Hart development, which will add 56,000 h.p. to that plant's capacity. The commission will require $1,750,000 for developments under consideration, and for distribution extension and improvement another $2,000,000. A $970,000 transmission line is planned from John Hart plant to Duncan Bay and the cost of another line from Clowhom Falls to Sechelt is estimated at $250,000.

Nigeria Expansion

A large scale plan to bring electricity to approximately ten million people in West Africa, is being prepared by the Electricity Corporation of Nigeria. The project, which will cost several million pounds, will involve the construction of a new steam power station close to a source of fuel, together with an associated grid system. Complete details have not yet been finalised, we understand. We have already reported that Mr. A. Earls, B.Sc., M.I.E.E., A.M.I.Mech.E., is going out to Lagos as chief engineer to the corporation next month; and other appointments are pending.

Concession to End

The Ismalia Municipal Council has unanimously decided to end the concession of the foreign-owned electricity company in the town as from August, 1953, instead of 1958. We learn the decision has been referred to the Ministry of Municipal and Village Affairs.

Power Survey

In Auckland this week, the annual conference of electric power boards and supply authorities opened. The principal item was a review of the South Island's power supply problems with particular reference to new generating stations, given by Mr. A. E. Davenport, general manager of the State Hydro-Electric Department. The power position there shows little sign of alleviation, in recent weeks the colder weather has resulted in consumption in the South Island being nearly 10% above the allocation.

A Rebate?

The Auckland Electric Power Board, N.Z., will hold back £10,000 from its next bulk power payment to the State Hydro-Electric Department unless its claim for a rebate is decided before the payment is due. The board is seeking a rebate to compensate for loss of revenue caused by the power shortage. Peak loading (on which bulk payments are based) has increased but rationing restricts the board in the units it can sell to the public. The board has been negotiating with the Department since 1947, and the matter has gone to Cabinet level apparently. It is to end this stalemate that the Auckland Board proposes to hold back the money.

New Project

The Taupo Town Board (North Island, New Zealand) has authorised the placing of contracts for the construction of its proposed hydro-electric power station on the Hinemaiai River. Orders for the manufacture of the generating machinery, which is at present under construction in England, were placed in January and current contracts cover the civil engineering works at the site. The principal contract is to be entrusted to Tapper Construction, Ltd., and the steel penstock to Spiral Welded Pipes, Ltd., and Tokoroa Engineering Co., Ltd. The total sum involved is £41,517. Capacity of the station is to be 1,400 h.p. The site of the project is in the gorge of the Hinemaiai River, five miles above its mouth, at Hatepe, on Lake Taupo. Here the river falls 105 ft. Reporting to the town board, Mr. Mandeno, consulting engineer, said that most of the distribution cables in the town area would consist of bare aluminium. He believed that this was the first occasion since the Electric Supply Regulations were introduced 30 years ago that bare cables had been approved for use in town areas. It was estimated that the use of the cables on l.t. lines would represent a saving of over £10,000.

New Jap Station

The Yamabe power plant of the National Railways on the Shinano River in Niigata Prefecture capable of producing 50,000 kilowatts was brought into operation recently. The station is the largest and the newest equipped one among 80 new power plants built in Japan after the war.

New Guinea Prospects

It has been decided to construct hydro-electric stations at Goroka and Kainantu in the Central Highlands of New Guinea, it is reported. Initially, these will be small installations, but capable of expansion as the demand increases. There are also plans for further surveys for hydro-electric schemes at Lae, Madang, Mt. Hagen, Wapenamanda and Kundiawa. New Guinea, of course, has already embarked upon the Rouna waterpower scheme for Port Moresby, for which tenders for necessary plant have been called, but Col. J. K. Murray, the Administrator, is convinced that there are enormous possibilities for hydro-electric development. He estimated that there is a potential of 100,000 MW of which 15,000 MW could be developed easily. It is thought that hydro-electric plants at several places in the Territories, each generating about a quarter to half a million h.p., could be developed fairly rapidly given the necessary equipment.

Stockholm's Underground

Work is well advanced on the construction of Stockholm's first underground electric train service (although an underground tramway system has been in operation since 1933). The new underground will link western and southern suburbs via a line through the city itself, and only the city section, extending 6½ kilometres, will be below ground. Already more than half of the tunnel has been completed. In this section there are to be five stations. Normally, trains of eight carriages will be used, each being motor driven. The average speed will be 38 km/hr, including stops, the maximum speed underground being 60 km/hr and on the surface 70 km/hr. Cables are carried along the walls of tunnels except at stations where they go under the platforms. Fluorescent lighting has been adopted for the stations themselves.

PERSONALITIES

IN THE INDUSTRY

Station superintendent at Huddersfield power station, Yorkshire Division of the B.E.A. since 1944, **Mr. F. Bates,** ASSOC.I.E.E., A.M.INST.F., has been appointed to a similar position at Thornhill generating station in the same division. There, he will succeed **Mr. C. Shepherd,** A.M.I.E.E., who is to retire later this year. Mr. Bates, who takes up his new position on October 1, began his apprenticeship with the Huddersfield Corporation Electricity Department in 1913. For many years he was general secretary of the Huddersfield Engineering Society. Mr. Shepherd has been at Thornhill since 1928, first as resident engineer and latterly as superintendent. Earlier, he had occupied a similar position at the Barugh station of the former Yorkshire Electric Power Co.

Mr. F. Bates

After 40 years' service **Mr. W. E. Loveridge** retires at the end of this month as resident director at the Hartlepool Works of Richardsons, Westgarth and Co. Ltd. He will retain a seat on the board. As resident director he is being succeeded by **Mr. T. P. Everett.**

Prof. Sir Eric Rideal, F.R.S., has been appointed a member of the Advisory Council for Scientific and Industrial Research from October 1. Sir Eric is Professor of Physical Chemistry at King's College, London. He was Professor of Colloid Science, Cambridge University, from 1930 to 1946, and Fullerian Professor of Chemistry and Director of the Davy-Faraday Research Laboratory at the Royal Institution from 1946 to 1949. **Prof. H. W. Melville,** F.R.S., retires from the Council on September 30, on completion of his period of service.

Following the recent retirement of **Mr. S. Stansbridge,** the Marconi International Marine Communication Co. Ltd. announces the appointment of **Mr. J. T. Marler** as manager of the Operating Division.

Veritys Ltd. announce that **Mr. C. J. Pitt** is giving up business and will cease to be chairman and managing director, with effect from September 30. He will have completed upwards of 55 years' service with the company. As from October 1, the Board will be constituted as follows: **Mr. H. B. T. Wilde,** F.C.A., Chairman; **Messrs. A. W. Hiley, R. S. Blackledge,** M.I.E.E., and **N. C. Hodson,** joint managing directors.

The Belfast Corporation Electricity Committee has now decided to recommend the Council to retain the services of **Mr. J. M'Candless,** M.SC., M.I.E.E., as deputy city electrical engineer and general manager at a salary of £1,800, rising to £2,200. His present salary is approximately £1,500 p.a., and the new scale is that fixed for his successor when the Committee accepted his resignation, which was to have taken effect from September 30. Alderman Cooper, chairman of the Electricity Committee, stressed that at no stage of the negotiations did Mr. M'Candless indicate any desire to withdraw his resignation. Each approach had been from the Committee side. At an earlier meeting it seems, Mr. M'Candless was asked to withdraw his resignation before the terms of his continuance in that appointment were discussed, but he said he would not remain unless he received the same terms as those provided for his successor. At the Committee meeting last week, Alderman Cooper, chairman, said the decision of the Committee to accept the withdrawal of the resignation of Mr. M'Candless, in the form presented, had changed an awkward situation for the better. (Earlier, Mr. W. J. Girvan, city electrical engineer and general manager, had intimated that he had submitted his resignation as a member of the Northern Ireland Joint Electricity Committee. It was considered that this was because the loss of Mr. M'Candless would have placed a very heavy burden on his shoulders in view of the numerous contracts now being dealt with.)

After 31 years' service with the British Thomson-Houston Co. Ltd., **Mr. A. E. Bartram,** chief clerk in the turbine construction department, retired recently. At a small luncheon party to mark his retirement, a presentation was made by **Mr. A. S. Kettle,** manager of the department.

Mr. T. W. Rice has been appointed district commercial engineer to the South-West District of the No. 1 sub-area, North-Western Electricity Board. He was previously sales superintendent in the Central District, Manchester, and was formerly with the Newton-le-Willows Urban District Council as distribution engineer.

Ekco-Ensign Ltd. announce the appointment of **Mr. M. A. Fraser** as representative contacting graded users in the south-east and south-west sectors of Birmingham and in Smethwick, Olton and Castle Bromwich. He will be based at the company's Birmingham office.

Mr. C. R. Ainley, who has been with Brush Electrical Engineering Co. Ltd. as a designer-draughtsman, has taken up an appointment with Crypton Equipment Ltd., Bridgwater, where he will act as a development engineer for the Foster switchgear division.

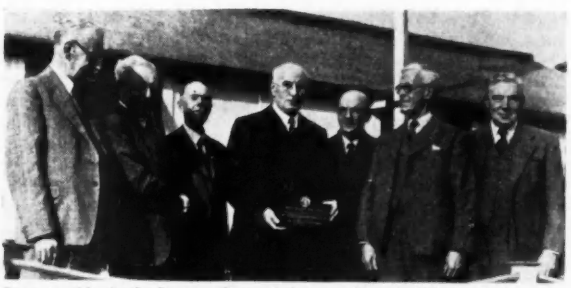
Mr. R. A. Erskine, M.A., M.I.E.E., chairman and managing director of Erskine, Heap and Co., Ltd., is leaving by air on Oct. 19 for a business tour of India, Pakistan and Ceylon. He will be away for approximately seven weeks during which time he hopes to contact some of the firm's bigger customers in these areas.

Mr. R. A. Erskine

Mr. Philip Noel-Baker, Minister of Fuel and Power, on behalf of the King, last week presented British Empire Medals to 34 fuel and power workers. Two gallantry awards went to **Mr. E. W. Boxall,** stoker at Guildford generating station, and **Mr. J. T. Matthews,** general foreman, Mitchell Construction Co. Awards for long and meritorious service in the electricity industry were given to Messrs. **J. H. Brown,** foreman linesman, Kilmarnock; **A. H. Chambers,** chargehand jointer, Birmingham; **F. Greenaway,** chargehand fitter, Uxbridge; **D. H. Griffiths,** linesman, Llanberis; **F. Mulryan,** mechanical foreman, Manchester; **J. G. Taylor,** foreman leading stoker, Stockton-on-Tees; **F. G. Timberlake,** fitter chargehand, Hastings, and **F. Wealthy,** assistant switchboard attendant.

Another who is off on a business trip abroad next month is **Mr. J. W. Perkins** sales manager with Gresham Transformers Ltd. He leaves for Australia, New Zealand and Canada on October 8, and will be calling at Colombo and Singapore *en route*. He expects to be away about ten weeks.

On Saturday last, **Sir Montague Hughman,** chairman of the Henley organisation, formally opened a new sports ground for the Henley Woolwich Works and Head Office Social Clubs. **Mr. J. H. Savage,** M.I.E.E., assistant works manager, presided, and **Mr. A. W. McArthur,** M.I.E.E., director and works manager, and several other members of the Board of the company, participated in the proceedings. The ground is at New Eltham, and covers an area of 7½ acres.



Opening Henley's Sports Ground. L to r. Mr. A. W. McArthur, Dr. P. Dunsheath, Mr. W. F. Bishop, Sir Montague Hughman, Messrs. E. Judge, F. Anderson and B. C. Wilkins.

The Watford Electric and Manufacturing Co. Ltd. announce that **Mr. R. G. Smith** has been appointed to the executive position of sales manager in addition to his position as director of that company. This appointment is in succession to the late Mr. Henry Coates, J.P., M.I.E.E., whose death was reported in these columns a short while ago. The company also announce that **Mr. R. M. L. Evans,** B.A.(Cantab.), M.I.E.E., has recently joined the firm as chief electrical engineer. Mr. Evans was lately on the staff of the Director of Electrical Engineering, Admiralty, and was formerly with the Metropolitan-Vickers Electrical Co., Ltd.

Dr. E. C. Rollason, M.Sc., Ph.D., F.I.M., formerly a delegate director and research manager of Murex Welding Processes Ltd., will take up his appointment to the Henry Bell Wortley Chair of Metallurgy at Liverpool University on October 1. On leaving the company recently he was presented with an inscribed silver salver on behalf of the staff by Lt.-Col. J. F. Todhunter, general manager. Dr. Rollason is to be succeeded in the position of research manager at Murex Welding Processes Ltd. by **Dr. W. I. Pumphrey,** M.Sc., Ph.D., F.R.S.A. Dr. Pumphrey was at Birmingham University where he graduated with a B.Sc. degree in 1942, and began work at the National Physical Laboratory on problems associated with the heat treatment of steel. In 1946 he became leader of the welding research team of the Aluminium Development Assoc., at Birmingham University, where he worked on problems associated with the welding of aluminium and its alloys.

The Minister of Fuel and Power has reappointed the following Chairmen of Electricity Consultative Councils in England and Wales: South Eastern: **Mr. M. A. Bulloch,** A.M.I.E.E., A.C.G.I.; Southern: **Mr. A. Lockwood**; South Western: **Alderman H. J. Perry,** J.P.; Eastern: **Alderman W. J. Bennett,** J.P.; East Midlands: **Mr. Lewis L. Perkins;** Midlands: **Alderman H. Leason,** J.P., A.M.I.E.E.; South Wales: **Alderman A. E. Gough,** J.P.; Merseyside and North Wales: **Mr. H. Evans,** J.P.; Yorkshire: **Alderman W. Leach,** J.P.; North Eastern: **Mr. W. S. Hall,** M.B.E., J.P.; and North Western: **Alderman Wright Robinson,** J.P., M.A. It will be recalled that the re-appointment of the Chairman of the London Electricity Consultative Council, **Mr. I. J. Hayward,** J.P., was announced some weeks ago.

OBITUARY

Mr. T. Leadbeater, M.I.E.E., formerly borough electrical engineer to the Hampstead Borough Council, died on September 17. He was borough electrical engineer for fifteen years, retiring in 1936. Prior to his promotion in 1921, he served as chief assistant, and altogether he spent 39 years with the Hampstead undertaking.

The Design Congress

ELECTRICAL manufacturing was represented in two of the papers at the 1951 Design Congress, organised by the Council of Industrial Design on Wednesday and Thursday of last week, the theme being "Design Policy in Industry as a Responsibility of High-Level Management." The conference was well supported by British and foreign manufacturers.

An interesting comparison between the methods used by two large organisations was provided by the papers read by MR. ARTHUR N. BEC VAR (Director of Design, Major Appliance Dept. of the American General Electric) and MR. C. S. AGATE, O.B.E., B.SC., M.I.E.E. (managing director, E.M.I. Engineering Developments, Ltd.). Pointing out that G.E. specialisation on appearance design began in 1928 with one industrial designer and a very small staff, Mr. Bec Var outlined the growth of "appearance" design, as it is more usually termed when applied to consumer goods. There is now a manager of design in each of the eight divisions of the company, while there is an overall committee consisting of one representative from each division. A review was given of the Appearance Design department set up within the major appliance division, and the way by which its activities were co-ordinated with the engineering, marketing and manufacturing sides, and in testing for consumer acceptance.

Mr. Agate reminded his listeners that E.M.I. Ltd. is one of the functional subsidiary companies of Electric and Musical Industries Ltd., and as such is responsible for design and development and co-ordination of technical knowledge within the group. Design policy is governed by the Design Executive Committee, which is composed of the managing directors of the factories, sales, and engineering development companies; backed by a working party; specifications agreed by the Design Executive Committee are passed to a design unit of experts who have access to other specialists and laboratory services which are centralised. "Stylists," as Mr. Agate termed those who contributed beauty of form to an article, are also available on the staff, but eminent outside designers are sometimes employed.

TRAINING ENGINEERS

AFTER prolonged debate in parliament, press and in official committee, the Government last week issued a white paper stating their policy for the development of higher technological education in Great Britain. A comparatively short document, this appeared under the aegis of the Chancellor of the Exchequer, the Lord President of the Council, the Minister of Education and the Secretary of State for Scotland: fair indication of the administrative complexity of the problem.

At University level, the expansion of technology is characterised as involving increased expenditure in new building, and this is limited by available resources. The expansion of post-graduate courses in technology, to be attended by those who have spent some two years in industry after their first degree is noted as an important experiment, and the number of places in these courses is to be increased. The question of establishing a large (2,000 to 3,000 student) technological university has been shelved for the present, on grounds of capital outlay (£6 million) and slowness of return (no new graduates for ten years). One similar possibility, that an existing institution should be expanded, is rejected on similar grounds. The whole problem of a technological university is, however, kept open for examination at a later date.

Higher technological education is also provided in some 66 technical colleges in Great Britain, and it is with reference to these that the main recommendations of the white paper are made. In general, the recommendations of the National Advisory Council on Education for Industry and Commerce (the Weeks' Council, see ELECTRICAL TIMES, November 16, 1950), are accepted. This entails increased financial assistance being given to colleges engaged in advanced technology, the development of new courses in technical colleges, in close association with industry, and the foundation of a College of Technologists to encourage the development in suitable technical colleges of advanced courses at the first award and post-graduate levels. Associateship, membership and fellowship of the new College are proposed rewards for satisfactorily completing such courses.

Recommendations in the Weeks' Council Report that the College of Technologists should approve the appointment of suitable external examiners to assist colleges in setting and marking their examinations have been abandoned for the time being, and so has the proposal that the College should be given the title "Royal." In more general terms, the opinion in the Weeks' Report that "we believe that the functions (of the College) should be concerned with the educational problems of technology, and not confined to the approval of courses and awards" has been specifically rejected for the present.

Commenting on the White Paper permanent officials of the Ministry of Education emphasised that the co-operation of the professional institutions should be sought, and that there will be an opportunity at some stage for further representations on the policy by interested parties. Past representations considered by the Ministry will not be published.

A P L E
Conference Diary

A COACH tour through the Sussex countryside, with tea at Arundel, last Friday brought to an end what was widely considered one of the most successful A.P.L.E. conventions of recent years. This particularly applied to the quality of the technical papers, and the discussions aroused. We are now able to give a summary of the remainder of the Conference proceedings, including the discussions on papers previously summarised.

TUESDAY

Much interest was shown in the paper on "Maintenance Organisation and Methods," by MR. C. C. SMITH of Liverpool, which was published in abstract last week.

DISCUSSION

MR. J. WILSON (Paisley) who opened the discussion said that he would like to hear a definition of a public lighting engineer. In his opinion he needed to be a qualified electrical engineer, not merely knowledgeable on matters concerning illumination. He was not in favour of overhead span wires, which he felt were extremely unsightly. Cascade control in his opinion was the best method. He also queried the author's advocacy of periodic photometric tests, which gave misleading results with the voltage variation prevalent nowadays. This subject was also raised by the next speaker, MR. F. S. NAYLOR, who asked for the author's views on them as a basis for payment on maintenance by annual contract. In his view photometric readings needed treating with reserve —the values being measured were very low and the variation due to extraneous sources of light could be considerable. There was difficulty in distinguishing between deterioration of the optical equipment and ageing of the lamp, which might lead to lamps being replaced earlier than was necessary.

MR. R. PARKER (Aberdeen) described a type of lorry-mounted tower wagon with a turntable, allowing considerable overhang. This, he felt, would solve many of the difficulties encountered in day-time maintenance on busy thoroughfares.

LT.-COMMANDER E. J. COOK, R.N. (ret.) (N.W. Electricity Board) asked for particulars of figures given in the paper. Regarding control, he was in favour of cascade operation in conjunction with photo-cell control. His Board, incidentally, did quote a fixed charge for injection control equipment. This matter was later raised by another member of the same Board, MR. H. HEWITT, who pointed out that present restrictions in capital expenditure were hampering the development of injection control. As regards the annual charge of £1 2s. 6d. per point mentioned by the author, he said that many factors would contribute towards making this either greater or less, according to circumstances, and quoted some typical figures of capital cost of equipment.

MR. E. H. JESTY (London Electricity Board) wondered if the author appreciated his good fortune in having an area of 25 sq. miles with 3,000 lamps under his control. In London 250 sq. miles contained 158 lighting authorities, which averaged out at one authority per 2,500 lamps, and he would like an opinion on the optimum size of an area. He also queried whether combined maintenance of gas and electric equipment was economic. Regarding the author's wall lantern installation he felt that an equivalent solution could be obtained with two 25-ft. standards carrying double units.

M. L. GAYMARD (Electricité de France) referred to the author's remarks on anodised aluminium reflectors. In France they were considered absolutely reliable and, due to their advantages in weight and resistance to damage, being standardised throughout France. Regarding daily inspection, this had been standard in Paris pre-

Illustration shows Mr. Pryce-Jones taking over from the past President, Mr. P. Richbell, M.Inst.G.E.

war, but exigencies now permitted inspection every second day in the city centre and every fourth day in the suburbs. Gas was being superseded throughout France—its running cost was three times as heavy. Injection control was very largely used throughout France, and maintenance was very low. Capital cost was, of course, heavy but installation was being undertaken as towns were being rebuilt, and the expense was shared between the local authorities and Electricité de France proportional to the amount of control allocated to each.

Other matters raised included the question of wayleaves for wall lanterns, the inadequate size of many pillar compartments, and various questions regarding trade union categories of men employed on maintenance and painting.

MR. C. C. SMITH made suitable reply.

WEDNESDAY

As foreshadowed last week, the paper on problems associated with traffic routes by Mr. W. R. STEVENS aroused considerable controversy. The delivery of the paper was accompanied by several clever demonstrations arranged by G.E.C. research colleagues of Mr. Stevens, and included comparisons of light reflection from actual portions of road surfaces which they had obtained, also a prototype for a proposed roundabout sign with a neon circle visible at over 1,000 ft in appreciably foggy weather.

DISCUSSION

MR. E. C. LENNOX (N.E. Board) agreed with the author that lack of money was the chief reason for bad lighting—and would continue to be as long as local authorities had to pay instead of a central authority. On the question of cut-off lighting he felt that non-cut-off gave a very much better general appearance in built-up areas, and referred to the "tunnel" effect which cut off created. Kerb distinction was also superior. Complaints that glare could be bad on non-cut-off lighting could be eliminated by the use of a sun visor. Fluorescent lighting was excellent, but its high cost meant that it was reserved for town centres, although he felt that the evolution of a sealed unit with a tube life of a year requiring re-lamping only in the summer would give a considerable fillip to fluorescent lighting. While he felt that unidirectional lighting was the answer for dual carriageways, he found the centre-mounted cut-off lantern intriguing. For roundabout lighting he preferred cut-off lanterns, the glare of the unidirectional lantern being objectionable. As regards road surfaces, co-operation seemed practically non existent. It was a waste of money to light bad road surfaces.

MR. E. STROUD (Bleeco) felt that in assessing the relative merits of cut-off and non-cut-off systems the author had weighted his arguments damning the cut-off system with faint praise, and he felt that his photograph had been taken on a foggy night. To suggest that the 90-ft. spacing for cut-off was a rigid dimension was misleading—the Code specified 90 to 110 ft. and every lighting engineer knew that there was certain latitude. For that matter, high-angle lighting required closer spacing than 150 ft on bending roads. Also cut off did not necessarily demand two poles per lamp—diamond suspension required only one pole per lamp with two additional poles at the end of the row. Cut off lighting might require 20% more lanterns, but not more power. He appealed for a more objective view of costs, and of the surface brightness required. Glare was more important than windscreen flash, and the "tunnel effect" referred to by Mr. Lennox he considered nonsense, and showed slides of cut-off lighting in a built-up area to prove his point.

MR. A. W. CHRISTIE (Road Research Laboratory) spoke on the work which was being done to reconcile the problems of non-skid surfaces and good reflectivity. The smooth surface advocated might be satisfactory when dry, but when wet the light patch degenerated into a bright streak. It was by no means an easy problem, but a satisfactory solution might yet be found.

MR. H. HEWITT (N. W. Board) pointed out an apparent paradox, low brightness sources tended to reduce glare, large areas tended to increase it. What was the optimum value—it seemed that there must be one ?

MR. R. PARKER (Aberdeen) gave his opinion that research laboratories concentrated too much on motorists, whereas the lighting engineer had to please everybody, and cut-off lighting was dismal for the pedestrian and not so good for the policeman. They had heard a lot about road surfaces, but everyone seemed to consider only new surfaces and overlooked what happened to a re-tarred surface when the gravel had come off, and road engineers might do some work on making the gravel stick to the tar. The suggestion that the public lighting engineer should experiment more was difficult—one could not install a system and then pull it out again. Some central authority should do the experimenting.

Several delegates contributed to the cut-off *v.* non-cut-off controversy. DR. R. H. BALLIN (Thorn) considered cut-off gave poor definition of the left-hand kerb. MR. C. R. BICKNELL (Siemens) disagreed with a previous speaker and felt that windscreen flash was more distracting than glare from high-angle lanterns. Regarding kerb definition he felt that cut-off was poorer on the left-hand kerb and deprecated anything which encouraged the motorist to hug the road centre. MR. E. H. SKINNER (S.E. Board) differed with the author on relative costs, quoting those for the London Road (Brighton). Capital cost of cut-off lighting should be very little more—and possibly even less than non-cut-off. The Author made suitable reply.

Fluorescence in France

Wednesday afternoon saw the delivery of a paper on "Fluorescent Street Lighting in France," by M. LUDOVIC GAYMARD, who is head of street lighting for the Electricité de France organisation. France tended to lag behind in the early days of fluorescent street lighting for several reasons, notably lack of funds until about 1947, and the reluctance of authorities to go ahead until experience in other countries gave reliable indications of costs and technical advantages. Paris decided to adopt fluorescent lighting for part of the Ave. du President Wilson in October, 1947, and 12 lanterns were installed on 30 ft poles with 10 ft overhang at 100 ft spacing, each lantern containing five 4 ft 40 W tubes. Further installations now exist in the Place de L'Alma, the Avenue Montaigne, Place Victor Hugo, and part of both the Faubourg St. Honoré and the Rue de Vangirard. Outside Paris, the entire town of Fécamp has installed it.

M. Gaymard

Judging from the quality of the slides shown, there is little doubt that satisfactory results are being obtained. It was particularly noticed that in many installations to obtain the distribution required, particularly on wide roads, lanterns were often installed tilted at a considerable angle to the horizontal. This effect, which appears to us not unpleasing, is considered by M. Gaymard to be very ugly. The design of French lanterns has very largely followed their British contemporaries, but a number of interesting departures were observed, including lanterns without reflectors.

Regarding costs, the fluorescent lanterns seem to cost from £25-£30 more per lantern. Maintenance costs have been relatively high since tubes have only been guaranteed for one year, and there is a high mortality rate amongst starting switches—so much so that they have been installed at ground level to save labour in replacement.

The outdoor display

DISCUSSION

The author's handling of the subject had been so thorough that it left little loophole for discussion said MR. J. M. WALDRAM (G.E.C. Research). He would, however, query the practicability of one of the lanterns shown with six 2 ft tubes. Regarding the French practice of inclining lanterns, he felt that there was little to gain. The development of lanterns without reflectors was interesting, and he presumed that it was influenced by German practice, which tended to concentrate on keeping glare to a minimum.

MR. E. H. JESTY (London Board) referred to high maintenance costs. As an experiment, lanterns in London had been left uncleaned for two years to see what deterioration took place, and it was found that the light output was well within the specified tolerance, and cleaning had now been reduced to twice a year. With increased life of lamps obtainable and improvements in starter switches, it should be possible to get down to an economical schedule of cleaning twice a year, with re-lamping every second cleaning and new starter switches every fourth.

MR. R. PARKER (Aberdeen) felt that the vertical lanterns shown by M. Gaymard were decorative only, but serious attempts had been made in this country to get a reasonable light distribution, and with modern designs and reasonable spacing, the vertical lantern could be useful as well.

A New Film

The last item on Wednesday's programme was the presentation of a new film, "Lighting the Streets," introduced by Mr. C. W. M. PHILLIPS (B.T.H.).

Mr. C. W. M. Phillips

The film, which is intended more for those who are not themselves street lighting engineers deals with the subject in three stages. Firstly, the need for good street lighting is illustrated by accident statistics and what might be termed "commonsense" traffic flow diagrams. The methods of obtaining good street lighting and the principles of silhouette vision are then dealt with, after which the requirements of the new B.S. Code of Practice are shown and the essential principles of planning an installation are illustrated with some most convincing model shots.

The Eastbourne Experiment

During a short discussion on this film, Mr. N. BOYDELL (S.E. Board) referred to an experiment carried out in Eastbourne (ELECTRICAL TIMES, December 28, 1950, p. 1043) where fluorescent units mounted longitudinally on the faces of buildings in main thoroughfares not only provided adequate direct illumination but owing to the light distribution were, comparatively speaking, absolutely glare free. If this method were applied more generally it would clash with the principles of silhouette vision and necessitate applications for modification of the Code.

THURSDAY

Main items of interest for electrical delegates on Thursday were the inspection of the outdoor display of columns and lanterns (reviewed in our last issue) and the annual luncheon, since the paper on "Design and Use of Street Lighting Equipment in relation to the Code of Practice," by MR. P. CRAWFORD SUGG was intended for gas engineers.

The Luncheon

The combined toast of "The County Borough of Brighton and The Guests" was proposed by MR. E. C. LENNOX, M.I.E.E., F.I.E.S., who referred to Brighton's early part in street lighting and to the close association between the President and the Mayor. Response was by the Mayor, ALDERMAN ERIC SIMMS, J.P.

Toast of the Association was proposed by the principal guest, LORD CITRINE, who pointed out that there was nothing controversial in the subject of better public lighting, although some might doubt the wisdom of expending fuel on such items as floodlighting football matches and the Festival. He hoped, however, that economic expediency would never completely blank out the cheer and comfort that illuminance could provide.

A.P.L.E. was characteristic of all public bodies, a comparatively small body of people who provided the driving force for the country. Many had questioned the value of conferences—but he had always tried to restore a sense of balance. One of the greatest problems of a large body such as a nationalised industry was how to keep alive individual initiative, and he was an unrepentant advocate of the conference system. If we departed from this we entered an industrial dictatorship.

Referring to the gas industry, he praised their ingenuity not only in refusing to accept defeat in street lighting but in keeping their flag flying in spite of the ban on promotional activities. To expect enthusiasts to refrain from promotional activities was like asking a fish not to swim. Too often monopolies left no room for internal competition, but he hoped that there would be no interference with the consumer's right of choice.

Pre-vesting fears of autocratic behaviour by Boards had proved unfounded, and there was no reason why public corporations and private enterprise should not sit side by side as they did in A.P.L.E., and he was delighted to see it happen.

In response, the President, MR. H. PRYCE-JONES, M.ENG., M.INST.C.E., M.I.E.E., said that the electrical industry was doing a good job of work. Unlike Socrates' friend who did not benefit from his journey because "he took himself with him," the electricity supply industry was very willing to learn from the experience of others. Industrial relations had developed a long way since the Taff Vale Railway had made regular attendance at church a condition of promotion. Regarding the present state of the country, neither a change of government nor the return of the same one could by itself solve the difficult problems which lay ahead—only the united efforts of ordinary men and women could do that. Given the right spirit they could face the future in the mood typified in *King John:*

> *". . . Naught shall make us rue*
> *If England to herself remains but true."*

FRIDAY

"Glass—An Old Material in a New Light," by MR. P. M. DAVIDSON, B.SC. (Pilkington Bros.) formed the concluding technical session of the Conference. Old and new methods of plate glass manufacture were demonstrated by means of sound films, after which modern methods of production of toughened glass, such as "Armourplate" and "Armourlight," and its capabilities were shown by a second film and demonstrations.

Water Purification

The Construction and Operation of the "Hydorit" Plant

THE removal of dissolved salts from water by electrolytic methods has long been known. Difficulty has, however, been experienced in the past in using this method commercially, as equipment has had to be designed to cope with each particular type of water supply, which vary widely in the composition and amounts of the dissolved salts. A recent process capable of coping with all types of hardness has now been developed by Ludwig Siebold of Vienna, whose British interests are in the hands of Mr. G. A. Stanley Palmer, A.R.Ae.S., Maxwell House, Arundel Street, Strand, W.C.2. A single Hydorit equipment can be made to produce from 10 to 200 litres per hour at an energy consumption of 25 kWhr 1,000 litres for dissolved salts at a concentration of 150 mg/litre and 45 kWhr 1,000 litres for concentrations of 400 mg/litre.

Operation

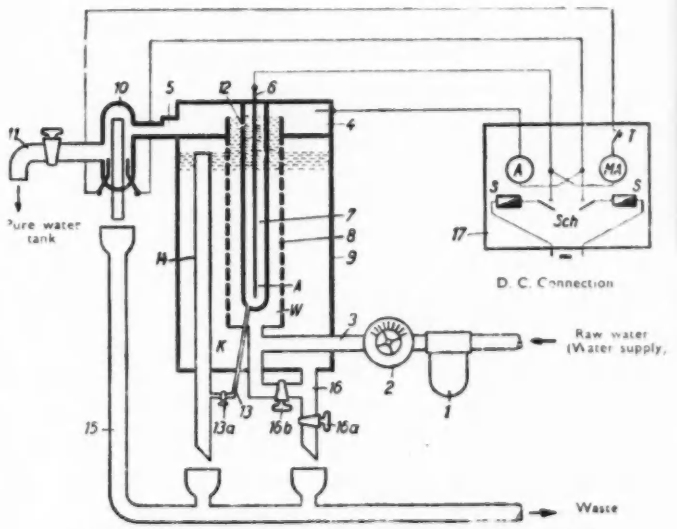
Referring to the diagram, the water enters at pipe 3, and is divided into two streams, one flowing upward for purification and one downward for rinsing. The upward stream rises through the annular space W, collects in the overflow channel 4 and is withdrawn from 5 in a purified condition. On its passage upward current passes through it from the anode 6 through the anode diaphragm 7, the space W, the cathode diaphragm 8 to the cathode 9. The ionised salts migrate into the space K and are washed away by the water from 16 through the overflow 14. Other ions, however, migrate into the anode space A and these are washed away by a small portion of purified water which passes through the orifice 12 and drains off via 13 and 13a.

The assembly 10 consists of a conductivity cell which enables the degree of purity to be assessed via the milliameter. In operation the tap at 11 is shut so that water standing in the equipment is drawn through the stand pipe in 10 to the drain 15. Switch T is operated and the milliameter observed until the required degree of purity is indicated when the tap at 11 is opened and the purified water drawn off.

Several cells have to be used in each equipment as line voltage is usually too high and the current must be limited to avoid overheating of the cell. The current applied must, of course, be d.c., and equipments are made for 110 V and 220 V operation.

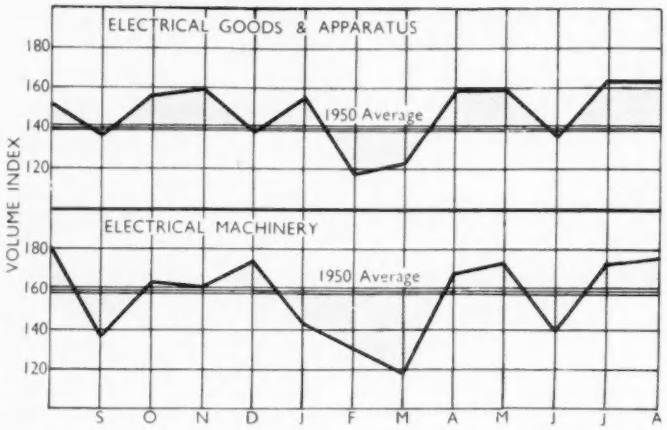
It is claimed that the control operations on a "Hydorit" plant take only a few minutes a day, and impurities amounting to only a few milligrammes can be removed from a large bulk of water with less than 1/20th of the energy required to perform the task by thermal distillation.

It should, of course, be noted that the process will not remove undissolved impurities which may be present in the water, which should be filtered prior to introduction into the equipment.



Schematic diagram of a single "Hydorit" purification cell

EXPORTS AND IMPORTS



EXPORT VOLUME INDEX

Last month's improved export figures were well maintained by the electrical industry during August, both in respect of electrical goods and apparatus and of electrical machinery. In the former classification the total value of goods sent out of the country was £8,896,690, just exceeding the July record figure. This is equivalent to 161% of the average 1947 volume, after allowance has been made for price changes since that year.

In the case of electrical machinery there is a more noticeable increase over July, but the total value of £4,618,609 is not a record. It is, however, equal to 177% of the 1947 volume, based on prices in that year.

STILL higher goes the figure for exports of electrical apparatus—August total was a further £187,972 in value higher than the sum for July. Generally there were only slight fluctuations in the individual values of the various classes of goods—it is noteworthy that the export of electric irons maintained at a steady rate. Complete electrically operated washing machines, not included in our table, numbering 23,310 with a total value of £548,694, were sent abroad last month compared with 13,932 machines valued at £291,004 in the corresponding month of last year. Some 2,077 electric portable tools amounting to £134,043 were also exported last month.

Description	Exports Value Month of August			Imports Value Month of August		
	1949 £	1950 £	1951 £	1949 £	1950 £	1951 £
Telegraph and Telephone Wires and Cables—						
Submarine	39,336	473,588	106,330			
Other	787,969	715,234	561,219	24,186	27,808	14,238
Rubber Insulated	357,993	349,552	580,241			
Insulated, other than Rubber	1,027,313	603,106	1,030,610			
Wireless Apparatus, including Valves	1,004,386	1,727,555	2,131,525	122,559	209,345	280,773
Telephone and Telegraph Apparatus	1,338,972	1,300,524	1,329,106	—	—	—
Electric Lighting Appliances, Accessories, Fittings and Parts:—						
Filament Lamp Bulbs	86,221	119,857	147,272	7,454	19,958	13,269
Other Descriptions	334,979	291,105	430,088	5,068	17,233	59,077
Batteries (primary)	82,730	117,391	185,589	—	—	—
Accumulators, Portable	215,096	191,403	351,031	—	—	—
,, Stationary	36,525	103,502	141,493	—	—	—
,, Parts and Accessories	84,629	68,680	67,143	—	—	—
Electrical Cooking and Heating Appliances	184,810	269,271	455,508	—	—	—
Ammeters, Voltmeters, etc., and Parts	98,624	107,671	160,485			
House Service Meters	116,088	111,280	94,966	19,719	24,181	42,915
All Other Instruments	91,693	115,864	106,007			
Electro-Medical Apparatus	39,633	44,131	36,528	—	—	—
X-Ray Apparatus, etc.	129,913	80,890	154,872	19,546	13,353	60,166
Insulating Materials	114,527	126,892	213,137	—	—	—
All Other Articles	377,136	506,165	613,550	87,714	86,741	110,992
Total of Group	6,547,973	7,443,661	8,896,690	286,246	398,619	581,430
Electrical Machinery:—						
Generating Sets (Diesel)*—						
Not exceeding 200 kW		1,102,883	514,260			
Exceeding 200 kW	949,549	218,942	126,432	21,768	11,628	45,057
Other Generating Sets		459,946	137,512			
Generators minus Prime Movers, and Parts†		245,312	792,915			
Motors	643,894	716,359	883,205	27,006	46,332	35,165
Convertors, Transformers, Rectifiers, Motor Control Gear, Switchgear, other machinery	1,508,108	1,784,585	2,164,285	21,090	13,517	22,943
Fans, Electrically and Power Driven	101,365	147,503	196,601	—	—	—
Vacuum Cleaners or Electrically Operated Appliances	260,506	293,626	450,810	—	—	—
Total Appliances and Machinery	10,011,395	12,412,817	14,162,710	356,110	470,096	684,595

* 1950 figures include generators minus prime movers. † 1950 figures for parts of generators only.

The BUYER'S *Column*

Power for Industry

CAPITAL generating equipment and ancillary gear is a subject which is not widely advertised as a proprietary brand, but such equipment needs to be of the finest quality if it is to take its place in the nation's power supply resources.

An attractive booklet issued by RICHARDSONS, WESTGARTH AND COMPANY, LTD., Hartlepool, contains an introductory story backed up with many good illustrations describing the range of equipment which is built in their works.

Water tube boilers to the designs of Foster Wheeler, Ltd., condensing and feeding equipment, turbo-alternator sets to the designs of Brown Boveri, and turbo-blowers and compressors, all embody the same high standard of design workmanship whether they are for large central power stations or for smaller industrial undertakings.

Heating elements of all kinds

A RANGE of heating elements of all sizes and types for industrial heating uses is available from HEDIN LTD., Commerce Estate, South Woodford, London, E.18.

Included in the range are strip heaters with spiral elements embedded in refractory material and sheathed in a Monel extrusion, cartridge heaters in solid drawn brass, Monel or steel tubes, band heaters with mica insulated elements sheathed with heat resisting rolled stainless steel, flat sheathed heaters similar to the hand heaters and asbestos woven Thermonets—non inductive with special treated yarn and suitable alloys in either wire or tape form—these are available for a maximum width of fourteen inches.

A brochure recently made available by the firm, gives concise details and prices of all patterns.

"Beetle Bulletin"

IT has been argued that the general public dislike plastic goods because of an alleged low standard of design and, indeed, it is pointed out, when money is short, costs are rising and materials are beginning to become scarce, manufacturers tend to neglect the appearance of their products and concentrate on production. Price matters and so does appearance when selling a product. Yet good-looking mouldings are not necessarily expensive if they result from close co-operation between moulder, designer, customer and materials supplier. With this need for conference between interested parties in mind, BRITISH INDUSTRIAL PLASTICS, LTD., 1 Argyll Street, London, W.1, have now initiated a new Product and Mould Design Department which, backed by the wide experience and full technical resources of the group, exists solely to help in design and produce good-looking readily mouldable articles at the most economical price.

Electrode Hot Water Boilers and the Winter

THE heating of business and domestic premises has always been a major factor to be considered when erection or modernisation is contemplated.

In the past when labour was plentiful and solid fuel a cheap commodity the primary question was whether a water heating unit was capable of producing sufficient water at the appropriate, although probably inexact, temperature.

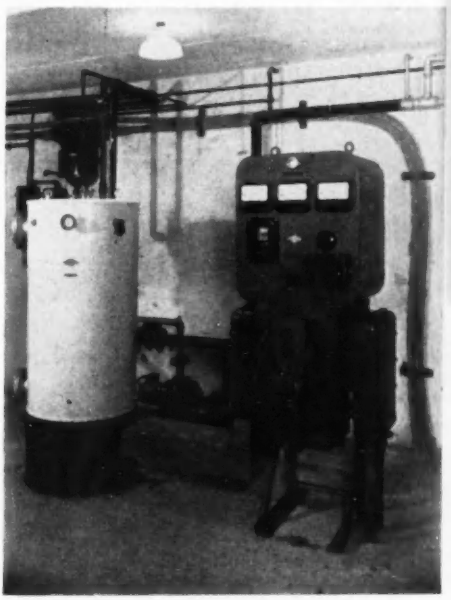
Today approximately 8% of the total cost goes to heating equipment and prevailing ideas tend towards cleanliness and greater efficiency.

Bearing these points in mind the case for electrode hot water boilers, with their automatic control requiring no labour, is today stronger than ever before.

An examination of the potentialities of these units will suggest many of the applications for which they can be readily adapted.

A wide variety of units are available, those made by G.W.B. ELECTRIC FURNACES LTD., Dudley, Worcs., under the trade name "Autolec" include a standard range of fully automatic hot water boilers from 100 kW to 1,000 kW for vol-

This "Autolec" electrode water heater is rated 450 kW



tages up to 600. Hand operated types extend from 30 kW to 100 kW. In addition, automatic boilers, suitable for high tension supplies, are supplied from 750 kW upwards.

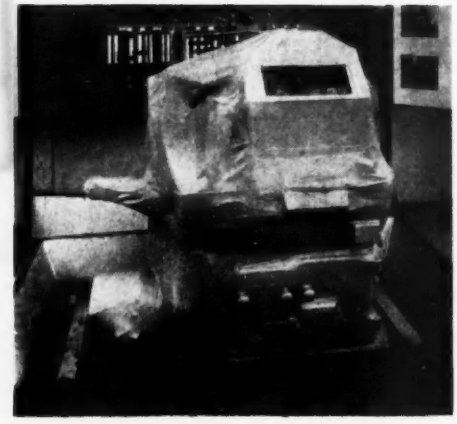
With the standard automatic water boiler the electrical equipment supplied includes an oil circuit-breaker complete with overload and no-volt protection coils, and a control panel housing the necessary control relays, ammeter, ammeter switch, indicating lamp and master rating control. Hand operated models have a contactor to carry the full load current of the boiler, an oil circuit breaker, control relays, ammeter and ammeter switch.

"Liquid Envelopes" solve packing problems

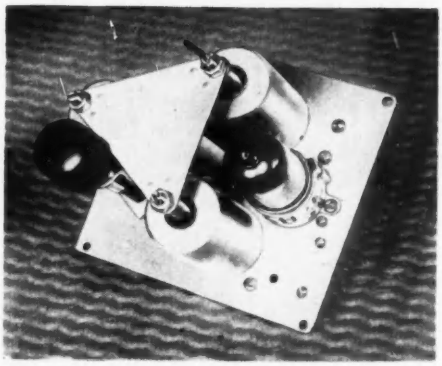
AN exhibit at the recent S.B.A.C. show at Farnborough, Hants, although more appropriate to the aircraft industry nevertheless would have proved most interesting to members of the electrical manufacturing industry had they been visitors.

EXPORT PACKING SERVICES, LTD., 6 Broad Street Place, E.C.2, have devised a satisfactory means of overcoming the problems of rusting and corrosion during transit. A process reminiscent of the storing "cocoons" used extensively by the American forces and to some extent in this country, the "Liquid Envelope" a form of plastic material which is sprayed over the goods for transit, forming a tough resilient entirely moisture- and vapour-proof covering. The desiccant content of the material absorbs all internal moisture.

The firm collects the goods in their own transport and removes them to their own works at Sittingbourne, Banbury, Cardiff or Merthyr Tydfil where they are prepared for shipment. On arrival at the destination after shipment, etc., the skin—usually 0.025 in. thick—is merely slit with a knife and peeled off.



A machine ready for export in its "liquid envelope"



Plessey's new tuner permits reception of transmissions on different frequencies

Plessey Introduce 5-channel T.V. Tuner

THE permeability-tuned gang multi-station television tuner introduced by THE PLESSEY CO., LTD., Ilford, Essex, permits the manufacturers of a single television receiver model to cover all five B.B.C. frequencies. It is the first unit tuner for the British stations to be made commercially available.

The unit comprises a tuned R.F. stage covering a frequency band of 40·0-70·0 M cs., and a mechanically ganged system of three coils—R.F. grid, R.F. anode and oscillator. The oscillator valve is not mounted on the unit.

Good tracking is achieved by the employment of padding coils. If the oscillator is working below signal frequency, the auxiliary padding coils are placed in parallel with the R.F. circuits, while when the oscillator is working above signal frequency, the oscillator coil itself is shunted.

The R.F. grid circuit padding coil is mounted outside the ganged R.F. coil, and serves simultaneously as an aerial coupling auto-transformer. It can be independently adjusted for an optimum performance by means of a threaded iron core.

Its high electrical stability is attributed to the use of temperature compensated tuning condensers in the oscillator circuit. Mechanical stability is attained by accurate machining of the tuning drive, and complete freedom of backlash resulting from the use of several independent springs and floating tuning cores.

Price Increases

AFTER a pause of some weeks we again record an increase in price due to the rising costs of materials, etc.

BYLOCK ELECTRIC LTD., South Street, Ponders End, Middx., announce that they have increased the price of the Classic vacuum cleaner to £8 19s. 6d., the Minivac vacuum cleaner to £6 10s. 6d. and the Vortex Light-industrial cleaner to £29 17s. 6d.

All outstanding orders as from September 22 will be executed at the new prices unless information is received to the contrary.

THE WEEK

COMMERCE *in news* INDUSTRY

Winter Outlook for Electricity

THIS month's "Bulletin for Industry," a review of the economic situation prepared by the Treasury, deals with the prospects for this winter from the point of view of the coal, steel, transport and electrical industries. It sets out some of the difficulties facing those undertakings and discusses the impact they are likely to have on industry in general. The facts are unavoidably gloomy, not least as regards electricity, where it is pointed out (once again) that demand far exceeds supply. Every step which flattens the peak and raises the trough will lead to a better use of generating resources, states the Bulletin, which goes on to say that new devices and tariff systems designed to achieve these ends are being studied. While generating capacity is continually increasing, by some 5% in 1950, demand, particularly domestic consumption, also increases, by some 7% annually, and will continue to do so unless action is taken to restrain it. Something of a consolation lies in the fact that in the U.S., demand is increasing at a greater rate—by some 10% each year.

Courses on Lighting

PROGRAMMES for E.L.M.A's Illumination Design Courses, to be held this autumn in five centres, were announced last weekend. The course to take place in London opens on October 8 at the Lighting Service Bureau, and extends over six consecutive Mondays. Subjects to be covered are: Terms and Definitions, Design, Electric Lamps, Lighting in Architecture, Industrial Lighting and Lighting Practice. A similar course at the L.S.B., Leeds, is of the same duration and opened yesterday, Wednesday. Others, comprising four lectures each, open at Carlisle on October 1, Darlington on October 2, and Newcastle-on-Tyne on October 4. At Newcastle, however, succeeding talks will be on November 1, February 28 and March 27, and not in consecutive weeks. Early application for tickets is advised in all cases.

Brassfounding in Britain and U.S.

THE British brassfounding industry is technically ahead of its U.S. counterpart although output per manhour is less, states the Anglo-American Productivity Team on the industry in its report published on Monday. The team's recommendations include some advice to management, who, it states, should give greater attention to plant layout, production planning, maximum use of mechanical aids, standardisation and simplification methods. The study of long-term profit-sharing schemes found in America, entailing the payment of accumulated yearly bonuses every ten years or so, is also advocated. One of the reasons given for higher productivity on the other side of the Atlantic was the closer relationship between management and workers.

Salary Increase for Electricity Staff

A SALARY increase of £50 at all points has been awarded to the higher clerical, administrative and commercial staff of the B.E.A. and the Area Boards. This rise, which is retrospective from June 1, refers to the salary scales for Grades 1-9, and private secretaries. The National Joint Council announced this decision of the Industrial Court on Thursday last. Approximately 12,000 employees are affected. The original application was for an all-round increase of 20%. Compared with some others recently, this award may at first sight seem liberal, but it should be remembered that the remuneration has, till now, been related to the cost of living in 1945.

Date of B.E.A.M.A. Dinner

WE understand that the annual dinner of the British Electrical and Allied Manufacturers' Association will now take place on January 24, 1952, and not on November 15, as previously announced and reported in these columns last month. The venue, Grosvenor House, Park Lane, remains the same, as also does other information already given.

Merger of Management Institutes

IT was announced last week that the Institute of Industrial Administration has been merged with the British Institute of Management, and all members of the former have become founder members, associates or students of the B.I.M. Following the merger, the I.I.A. has in effect become the professional wing of the B.I.M., whose membership does not constitute a professional qualification. It will be recalled that the I.I.A. was

The First Half-Century

Considering the urgent need of doing something to improve the shrinking railway dividends, a wholesale electrification of our railways may be less remote than one is at first sight inclined to imagine. What is wanted is a practical demonstration of the financial results of the electrical working of an ordinary railway.—*From our issue of September* 26, 1901.

Ekco's radio and television showroom at their London office in Vigo Street, W.1, has been redesigned and redecorated in recent weeks. This illustration shows an impressive view of one corner of the new room which includes the reception desk

founded in 1920 with the object of developing the science and technique of industrial administration. The B.I.M., on the other hand, was established four years ago on the advice of a committee of industrialists headed by Sir Clive Baillieu, who was at that time President of the Federation of British Industries.

"Lady Norrie" is Australia's First

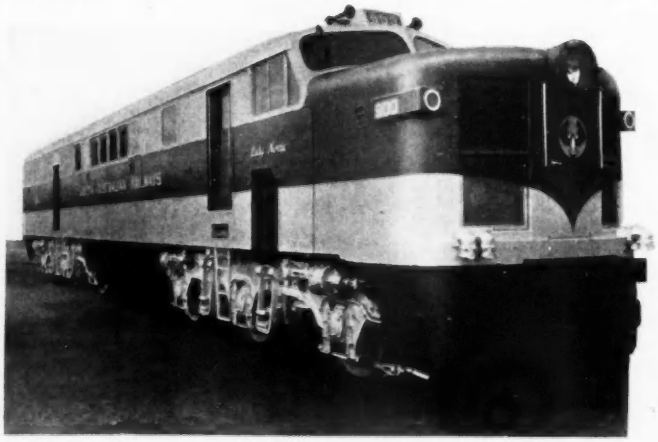
THE first diesel-electric locomotive to operate on regular schedules on the Australian mainland has been commissioned by the South Australian Government Railways. The "Lady Norrie" completed her first trial run of 300 miles early this month and went into regular service a few days later. She is the first of ten 1,760 h.p. main line diesel-electric locos ordered by the State Railway. The motive power equipment, including the diesel engine, generator, traction motors and control gear for this and the other locomotives under construction, were supplied by the English Electric Co. They will be used in pairs to haul the Overland Limited Express and 600-ton freight trains over the Mount Lofty Ranges, where the ruling grade is 1 in 40. Each has a maximum starting tractive effort of 60,000 lb, a continuous tractive effort of 34,000 lb at 15 m.p.h., and a maximum service speed of 70 m.p.h. Twelve of the same company's diesel-electric locomotives of 660 h.p., constructed jointly with the Vulcan Foundry Ltd., are now running on the main lines of Tasmania. There is a total of 32 of these now on order.

Safety First among Y.E.B. Drivers

"SAFETY FIRST" is more than a mere motto among the 398 regular drivers employed by the Yorkshire Electricity Board. Judging from results in a Safe Driving Competition, the principle has been put into practice. No fewer than 328 of those drivers have just received awards from the Royal Society for the Prevention of Accidents for blameless driving during 1950. Standards set by the Society are extraordinarily high—a driver involved in the slightest accident must be completely free from blame or he is disqualified from the year's contest—a factor which adds considerable merit to the efficiency of the Board's drivers.

Duke accepts New Office

CONTINUING its long association with the Royal Family, the City and Guilds of London Institute has announced that H.R.H. the Duke of Edinburgh has accepted the presidency of the Institute, to which office he was elected on Friday last. The announcement will cause no surprise, for readers will easily recall the eloquent address the Duke delivered to the British Association a short time ago, when he expressed his great interest in technological education. The Institute's connections with royalty go back to 1881, when H.R.H. Prince Leopold, Duke of Albany, laid the foundation stone of the Finsbury Technical College. H.R.H. the Prince of Wales became its first president in 1882,



A striking picture of the "Lady Norrie," which recently became the first diesel-electric loco to run a regular service on the South Australian Railways. Diesel and electric equipment was supplied by English Electric who, besides having nine other locos on order for the same State, are to supply a further 32 to Tasmania

Interior and exterior views of a motor showroom at Woodford Green, where Benjamin fittings were used in a recent lighting scheme

Queen Victoria granted a Royal Charter in 1900, and King Edward VII became Visitor and Patron the following year. The office of president has since remained vacant.

Radio Servicing Exam Results

RESULTS of this year's Radio Servicing Certificate Examination were announced last week by the Radio Trades Examination Board and City and Guilds of London Institute. The exam took place last May, and of the 290 candidates who appeared, 117 passed both the written and practical tests. In addition 46 students satisfied the examiners in the written test but were referred on the practical side, while a further 19 completed the examination, having been referred in the May, 1950 practical test. Last year's results showed that 137 candidates were successful out of a total entry of 264.

U.K.C.T.A. Examinations

ONE hundred and thirty-two candidates passed the examinations in salesmanship organised by the United Commercial Travellers' Association of Great Britain and Ireland which were held in London and 19 provincial centres on June 30 this year. Eleven of these passed with distinction and 21 with credit.

The "Herbert Davies" medal has been awarded to Mr. F. B. Simpson of Hull, the candidate who achieved the highest marks in the complete examination.

These examinations require a comprehensive knowledge of salesmanship and general knowledge of sales organisation.

E.I.B.A. Year Book

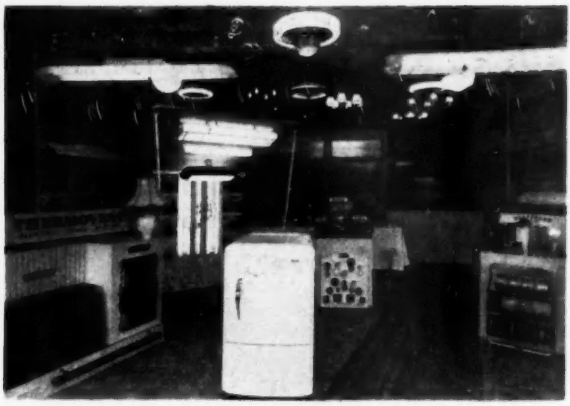
ALL in the electrical industry who appreciate the work of E.I.B.A. will welcome the 1951 edition of that Association's Year Book just published. The booklet contains much factual information on achievements during the past year, including the annual report (dealt with in our July 19 issue), accounts, lists of officers, beneficiaries and local committees. The opening page shows a photograph of Broome Park, Betchworth, the Surrey home for retired people, which may be termed as the outstanding contribution to the industry by E.I.B.A. Also among the book's 34 pages are three other snaps depicting life at this home. Another important item is a graph showing the steep rise in the number of cases dealt with since 1936. We note that the number of dependants and cases has increased from some 200 to 1,125, while the number of cases only has risen from 120 to 540.

Showroom Illuminations

AN exemplary installation of both interior and exterior lighting was carried out recently at the Woodford Green (Essex) motor car showrooms of Lambs, Ltd. Fittings were installed by the dealers' own staff using equipment supplied by Benjamin Electric. Inside, the angle version of Flurolier type reflectors were installed in a continuous run above the shopfront windows. Each fitting houses one 5 ft 80-watt fluorescent lamp. The various models exhibited have been accentuated well, and with the addition of floodlights outside, the overall picture of these premises is most attractive. A tower above the main entrance has been illuminated by two 400-watt floodlamps, and the small top portion of this tower by a single 300-watt lamp. The "illuminations" are completed by the existing neon signs.

Half London Tram Routes Replaced

EARLY next month London Transport's £9 million plan for the conversion of tram routes to bus services will pass the half-way mark. The next stage in the conversion, which is to take place on October 6, will be the fifth to date and involve some 56 miles of tram routes, or seven services. This will bring the total number of routes so far replaced by bus operation to 28. The complete abolition of London's trams will probably be effected in four more stages by October of next year. Many of the old vehicles making their final journeys on Saturday week will end their "public lives" with a run to the tram "graveyard" at Charlton.



A view of the interior of new showroom opened by Drubel Distributors Ltd., in Stafford Road, Croydon, showing a variety of the goods displayed. It is intended primarily for the trade

Service in the South of London

IN view of the increased volume of business which the company is at present enjoying and an increasing need for more storage space, Drubel Distributors Ltd., well-known factors in Croydon, decided to expand. They have acquired new premises facing Waddon Station (S.R.) in Stafford Road, Croydon, and last week saw their opening as a showroom, trade counter and store.

After extensive alterations one shop has been fitted out as a showroom where some 50 different lighting fittings can be displayed in addition to other regular lines, cables, conduits, heating and domestic appliances, refrigerators and other equipment. The showroom is intended solely for the use of the trade where contractors or dealers may send their customers, and although members of the public may not buy direct from the firm, they are invited to look round the showroom.

Work is well in hand on the new East Yelland power station at Barnstaple. Recent pictures show (left) the boiler house, and (right) the laying of reinforced concrete foundations. The new station will have an installed capacity of 180 MW comprised of six 30 MW turbo-alternators the first of which is expected to be brought into commission towards the end of 1952

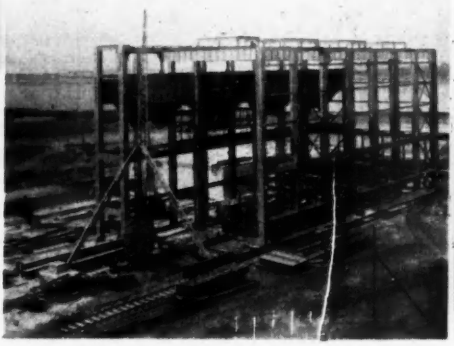
Yorkshire Board Summons

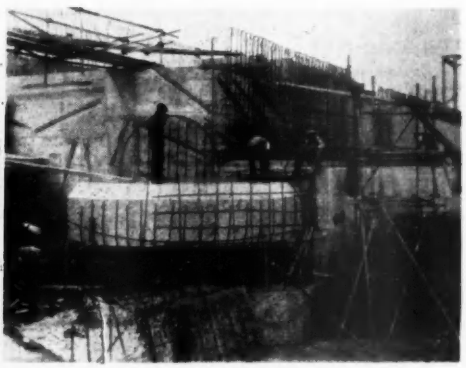
TWENTY-FOUR summonses were brought against the Yorkshire Electricity Board chairman, Col. W. M. Lapper, and deputy chairman, Mr. F. Newey, before West Riding magistrates at Leeds on Tuesday. In the main, the summonses accused the defendants of executing work at the Board's Headquarters at Scarcroft to an amount of £40,000 in excess of authorisation granted by the Ministry of Fuel and Power. Mr. R. Cumming-Bruce, prosecuting, said all summons came under Section 56A of the Defence Regulations and related to three different operations executed by the Board during 1949 and 1950. He said that a number of them related to the construction, reconstruction and alterations of their headquarters; another to some outbuildings on the estate at the headquarters and yet another to buildings at Bramhope. An authorisation having been granted by the Ministry of Fuel and Power for £32,000, work was executed in excess of the net authorisation by no less than £41,000, he alleged. No further information of these proceedings was available at the time of going to press. The hearing was expected to last some days. Mr. Withers Payne is acting on behalf of the defendants.

Engineering Training in Birmingham

NOW available to interested students is the prospectus of the 1951-52 session of the Department of Electrical Engineering of the College of Technology at Birmingham.

Besides the normal telecommunications and electrical engineering work the College is again





offering a series of post-graduate lectures on servo systems, system protection, industrial electronics and electrical engineering for non-electrical graduates. These were started last year and met with considerable success. It is hoped that circumstances will permit the provision of two further courses of short duration on the limitations of electrical machine design and high frequency heating. The department is again running a complete range of radio service work, the television servicing course.

Display of Visual Aids

A PRIVATE exhibition of Visual Aids, organised on behalf of Newton and Co. Ltd., London, and John Saville and Co. Ltd., York, is to be held at the Hotel Metropole, Leeds, between October 30 and November 2. Its object will be to illustrate the various ways in which visual aids can be used for industrial and commercial purposes. These include staff training, quality control of mass-produced components, sales demonstrations and general exhibition and display work. The exhibition sets out to show, by means of films and demonstrations of actual apparatus suggested, how these aids can be employed.

Marconi Equipment for Lime Grove

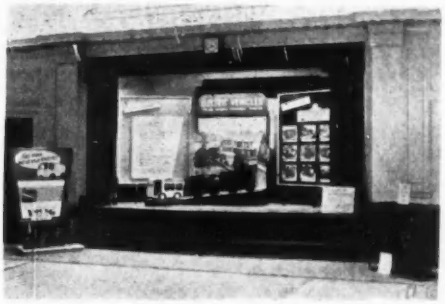
NEARLY £50,000 worth of television equipment has been ordered by the British Broadcasting Corporation from Marconi's Wireless Telegraph Co., Ltd. for use at the new Lime Grove, London, studios. The equipment includes six complete Marconi Image Orthicon camera chains, nine 10 in. picture monitors, one supervisory desk, a 16-in. picture monitor, a complete set of inter-communication equipment, vision mixing, relaying and amplifying installations, waveform generators and test equipment and six monoscope cameras and camera channels.

V.I.P.s at Rugby

RUGBY works of British Thomson-Houston Co. entertained two V.I.P.s a short time ago, who wanted to see the manufacture of radar equipment which is now on order for their country. The company's guests were H. E. M. Gunnar Hagglof, the Swedish Ambassador in London, and Brig. Hedqvist, Swedish Military Attache. They spent the morning in the radar factory and after lunch were shown round the fabrication, heavy plant, turbine and motor works.

'Twixt Summer and Winter

AFTER a brief respite during the holiday months, many of the social clubs in our factories and offices are embarking on another season's activities. Benjamin's Amateur Dramatic Society got away to a fine start with the production of *Heaven on Earth*, a one-act domestic comedy. B.I.C.C.'s amateur dramatic society also gained an outstanding success in its presentation of *Mr. Pim Passes By* at the Cripplegate Theatre. Another successful venture, in a different vein, was W. T. Glover's Horticultural Show where some 370 entries attained a "very high standard." At Telcon's Works at Greenwich, there was something of a curtain raiser when over 60 students and graduates were entertained at a social in the canteen. Summer activities are by no means over, however; the G.E.C. held their 1951 annual golf meeting recently when, despite challengers from overseas, the many trophies remained with the home organisation. Sloan Electrical's Social Club took its annual outing late this year, but nevertheless enjoyed fine weather at Clacton. The club was joined, incidentally, by many delegates attending the company's sales conference a few days earlier.



A display at Eastern Electricity Board's Northmet showrooms (Wood Green) earlier this month, to promote interest in battery electric vehicles. Exhibits were on show in an adjoining car park and included four 10 cwt. vehicles, one 20 cwt. van and a 20-cwt. chassis. Similar displays are also being shown by E.E.B. at Luton, Cambridge, Peterborough, Great Yarmouth and Chelmsford

NEWS IN BRIEF

In an advertisement which appeared in our issue of 20th September the range of geared motors supplied by Electropower Gears Ltd., reads "$\frac{1}{4}$ h.p—27 h.p." this should read "$\frac{1}{4}$ h.p. to 1 h.p."

A memorandum explaining the important provisions of the Coal Mines (Officials and Inspections) General Regulations, 1951, and giving some guidance on the application of those provisions, has been published by the Ministry of Fuel and Power. It is available from H.M.S.O., price 1s.

In our note concerning the 24th annual dinner of the Electrical Power Engineers' Association in the September 6 issue, the price of tickets to non-members was stated to be 27s. 6d. This should have read 37s. 6d.

Marconi's Wireless College celebrates its golden jubilee next month. Opened on October 12, 1901, it was moved three years later to the company's Chelmsford works, and in 1920 was re-established on its present site in Arbour Lane.

The Midlands Ideal Home Exhibition opened at Bingley Hall, Birmingham, yesterday (Wednesday) and continues until October 20.

Lancashire Dynamo and Crypto (Mfg) Ltd.'s sales conference is to take place this Friday and Saturday at Droitwich Spa.

Electric Supply News

East Midlands

The East Midlands Electricity Board is to introduce new industrial tariffs with effect from next March, the Area Consultative Council was told last week. For consumers taking supplies from the high-voltage mains a monthly maximum demand tariff will be offered, consisting of a charge per kVA of m.d., and a unit charge, with a coal price variation clause. Small industrial consumers taking supplies from medium or l.v. mains and whose requirements will generally not exceed 100 kVA will be offered a monthly m.d. tariff or alternatively a block tariff under which the price p.u. falls successively in two stages. In the past certain industrial consumers have had their lighting supplies metered separately and charged at a higher rate. Under the new tariff, lighting in premises where the main use is for motive power will be considered as part of the main supply and charged accordingly.

Edinburgh

Because the provision of underground cables would have involved the South East Scotland Electricity Board in an additional expenditure of some £6,000, Edinburgh Corporation Planning Committee recently agreed, "with reluctance," to the construction of a 33 kV overhead line between Portobello and Monktonhall. In doing so, the committee rejected their sub-committee's recommendation that the line should be underground. The board had asked the sub-committee to reconsider this recommendation because the cost would be increased from £7,000 to £13,000.

Eire

A revised scheme of electricity rationing to come into operation in Eire on October 1 provides more liberal allowances than those operating under the plan in force since May 30. For general purposes, including heating, consumers may use 90% of their basic allowance, instead of 75%. The ration for lighting, where separately metered, is 100%, and for water heating it is increased from 50% to 75%. The space heating allowance is 75%, but the summer ban on shop window lighting and outside electric signs is lifted.

Malvern

The Midland Electricity Board has been authorised by the Minister of Fuel and Power to take power into Herefordshire by placing lines above ground in the parishes of Little Malvern and Castlemorton and Ledbury rural area. This decision has been notified to the Malvern Hill Conservators. In accordance with the Conservators' suggestion last April, the Minister has ordered that part of the proposed line be placed underground.

Midlands

The Midlands Electricity Board has published a formal notice that application has been made to the Minister of Fuel and Power for consent to alter the type and/or voltage of existing non-standard systems of supply in its area to the standard 240/480 V 1-ph., and 415 V 3-ph. In the Birmingham Sub-Area alone, there are about 24,000 consumers still on d.c., apparently.

Northern Ireland

A new 31·5 MW turbo-alternator at Ballylumford power station was formally put into operation last week by Lady Scott. At the ceremony, the Minister of Commerce, Mr. W. V. McCleery, referred to the Northern Ireland Electricity Board as having just celebrated its twentieth birthday and within that period it had achieved the by no means small feat of changing the face of rural Ulster. In 1931—when the Board was set up—of a total of 75½ million units of electricity sold in Northern Ireland, only 3·9% or less than 3 millions were sold outside Belfast and Londonderry. In ten years' time sales amounted to 60½ million units. Sales outside the areas of the cities had by then increased to 76½ million units and the percentage of the total consumption in Northern Ireland to 28½%. Since then the Board had progressively extended their area of supply and had acquired more existing undertakings, so that, by 1950, they sold 251,700,000 units of electricity, or 41% of the total for Northern Ireland. The position today was that the Belfast Harbour power station contained plant to a total of 144,750 kW—Londonderry's plant totals 12,250 kW—and the set which had been switched on on that day brought the capacity at Ballylumford to 124,500 kW. The next addition to plant capacity would be the set nearing completion in the Harbour power station which would be followed by the new station at Victoria Channel, Belfast, recently approved by the Government. Londonderry was also increasing its capacity by 6,000 kW and sites outside Belfast were being considered for future additional plant, including possible hydro-electric schemes on the rivers Bann and Mourne, investigations into which were now well advanced.

Rochdale

A new main substation at Castleton was officially inaugurated recently by the North Western Electricity Board. Mr. O. Howarth, chief engineer to the Board, explained that in the past the Rochdale supply had come mainly from Kearsley and to a lesser degree from Padiham. The substation takes in a new supply from Chadderton power station, six miles away.

Rugeley

Proposals are being formulated for the establishment of a new colliery at Lea Hall Farm, two miles south-east of Rugeley, in conjunction with which a new power station will be erected for the Midlands Division of the B.E.A., it is reported. The pit would produce 1,500,000 tons of coal a year.

LIGHTING SCHEMES

Atherstone.—The R.D.C. is to improve street lighting at Ansley Common at a cost of £946. The question of uniform street lighting is also under consideration.

Churston.—A proposal to install street lighting on the Broadsands estate, at a cost of £696, has been referred to the annual parish meeting.

Cullompton.—The Parish Council is again negotiating with the South Western Electricity Board for the provision of street lighting.

Girvan.—Permission has been given by the Scottish Home Department to borrow £2,064 to convert the gas lighting system in the burgh's unclassified roads to electricity. But at the recent town council meeting, after discussing the relative merits of sodium and mercury lamps, it was agreed to postpone a decision.

Malvern.—The local Chamber of Commerce has decided again to approach the U.D.C. to ask that body if they would consider brightening up the town by erecting coloured lights in the streets

Prestatyn.—The U.D.C. is preparing a scheme for the general conversion of street lights.

Company Activities

A. Reyrolle and Co. Ltd.

The directors propose an increase in the authorised capital from £2,000,000 to £3,000,000 by the creation of 1,000,000 new ordinary shares of £1 each.

Associated Electrical Industries Ltd.

Holders of the 8% "A" Preference are reminded that the right to convert their holdings into 4½% "B" Preference shares and to apply for new Ordinary at the rate of three new shares for every ten 8% "A" Preference converted, expires on September 30.

C. A. Parsons and Co. Ltd.

The directors propose a bonus issue of one new ordinary £1 share for every one held. Present issued ordinary capital totals £600,000.

East African Power & Lighting Co.

Group profit for 1950 amounted to £279,442 compared with £267,908 for 1949. This figure is struck after allowing £152,629 (*£123,699*) for depreciation, but before charging taxation of £27,700 (*£9,109*). The final ordinary dividend is 4%, making 7% (*same*).

Electric and Musical Industries

The directors have declared an interim Ordinary dividend of 8% in respect of the year to June 30 last. They have also decided to recommend, at the annual meeting in December, that a final of 4% be declared and that the amount thereof be either payable if circumstances permit or carried to a special dividend reserve. For several years previously the distribution has been 8%, including a 2% bonus.

Ferranti Ltd.

For the year ended June 30, group profit amounted to £540,129—an increase of £292,029 over the previous twelve months. This figure is arrived at after setting aside £646,000 (*£297,000*) for taxation. The Ordinary dividend is again 6%, and there is £450,000 (*£200,000*) transferred to general reserve.

J. and F. Stone Lighting and Radio

Trading profit and sundry income for the year to June 30 last, amounted to £515,054 (*£412,077*). The net profit, before taxation is £423,705 (*£339,306*). Taxation absorbs £259,625 (*£190,175*). The final Ordinary dividend is 30%, making 40%. There is £170,577 (*£102,797*), carried forward.

Johnson Matthey and Co.

The directors have announced that acceptances of shareholders under the rights offer of 737,776 Ordinary shares of £1 each at 54s. per share were received as to over 98%. A very large number of excess shares was also applied for and allotments in respect of such applications had to be on a nominal basis.

Kalgoorlie Electric Power and Lighting Corpn.

Net profit for 1950 was £6,593 (*£24,550*), with £9,312 brought in, less £2,429 surcharge and an under provision for taxation in previous years of £131, allocating £6,000 to depreciation reserve, there is a balance of £7,299 which the board recommend should be carried forward. Mr. W. Talbot, the chairman, states that the year under review has been one of difficulty for the company which, in common with the gold mining concerns (who are its principal consumers) is suffering severely from a rising spiral of costs in Australia. For instance the amount expended on operation and plant maintenance wages and salaries at £A69,850 in 1950 was 20% higher than for 1949 with a comparable number of employees. The price of wood fuel has also materially increased. Although under their licence the company is permitted to pass on the bulk of any increases in cost of labour and fuel, it is still left with a heavy burden of extra costs. This necessitated an increase in power charges but the owners of the gold mines have opposed the rise and the matter went to arbitration. Their decision is awaited.

Dividends Declared

Bennis Combustion Ltd.—Final Ordinary dividend of 10%, making 15% (*same*). Group profit, after taxation, £24,772 (*£24,586*).

C. A. Parsons and Co. Ltd.—Interim Ordinary dividend of 7½% (*same*).

Ransomes and Rapier.—Interim of 2%, tax free, payable on November 30.

Solus Teoranta.—Dividend of 7½% (5%), including bonus of 2½% (*nil*).

Commercial Information

CONTRACTS OPEN

HOME

Sept. 28.—Durham C.C. Electrical installation in five pairs of police houses at Duckpool Lane, Whickham. Plans by County Architect, Court Lane, Durham.

Sept. 28.—Heywood T.C. Supply of 40 steel standards with 15-ft. bracket arms, and suitable equipment for the installation of 140 W sodium class A lighting. Lighting Superintendent, Market Hall, Hind Hill Street, Heywood.

Sept. 28.—West Riding. Adaptations and additions to electrical installation at County Fire Service H.Q. at Egerton, Huddersfield. County Architect, "Bishopgarth," Westfield Road, Wakefield.

Sept. 29.—Belfast R.D.C. Electric wiring work in connection with housing schemes at Whitehouse (34 houses) and Whiteabbey (8 houses). W. H. Jones, Clerk of the Council, Council Office, 51 Lisburn Road, Belfast.

Sept. 29.—Bristol. Supply and installation of sewage pumping plant which includes electric motor, switchgear, etc. J. B. Bennett, City Engineer, Arno's Court, 470 Bath Road, Brislington, Bristol 4.

Oct. 1.—Acton. Installation of street lighting in Western Avenue. Borough Engineer, Town Hall, Acton, W.3.

Oct. 1.—Bradford. Supply and erection of 4 automatically controlled, electrically driven pumping units, two with capacity of 1,400 g.p.m. and two 4,200 g.p.m. Sewage Works Engineer and Manager, Esholt Hall, nr. Shipley. Deposit £2 2s.

Oct. 1.—Devon. Mental Hospital Management Committee invites tenders for rewiring of power, light, fire alarms and clock systems at Digby Hospital, Exeter. A. N. Grens, Haycroft House, Filton, Bristol. Deposit £3 3s.

Oct. 1.—Limavady R.D.C. Electrical installations in houses and bungalows in course of erection at Ballyquin and Largy sites. Particulars from W. and M. Gwen, Architects and Civil Engineers, 1 Waterside, Coleraine, or A. Mitchell, Clerk, Council Office, Limavady.

Oct. 1.— Newcastle-upon-Tyne T.C. Electric lighting and power installation at Blakelaw Girls Secondary School, for Education Committee. City Architect (Education Section), 18 Cloth Market, Newcastle-upon-Tyne. Deposit £2 2s.

Oct. 2.—Leyton T.C. Provision, wiring and fixing of lighting in public hall, Town Hall. Further details and documents from Borough Engineer and Surveyor, Town Hall, E.10. (See Sept. 6 issue.)

Oct. 2—Plymouth. Part of contract for proposed primary school at Pennycross involves electrical installation. Applications by above date to City Architect, H. J. W. Stirling, Seymour Rd. Deposit £3 3s.

Oct. 3.—Carlisle. Electrical installation at Harraby infants' school. City Surveyor, 18 Fisher Street.

Oct. 3.—Chichester. Supply and erection of five automatically controlled electrically driven pumping units and auxiliaries. Water Engineers' Office, Greyfriars, North Street. Deposit £2 2s.

Oct. 3.—Downpatrick T.C. Supply and installation of 9 direct-driven centrifugal, electrically propelled pumps for town's sewage scheme. M. J. Hayes, Town Clerk, U.D.C. Offices. Deposit £5 5s.

Oct. 3.—Manchester. Supply of torch lamps and of wire and cable, lanterns, standards and time switches for street lighting purposes required by Highways Committee for 12 months beginning Jan. 1, 1952. City Surveyor's Department, Town Hall.

Oct. 5.—Liverpool T.C. Rewiring the electrical installation of St. John's Market. City Engineer and Surveyor, Municipal Buildings, Dale Street, Liverpool.

Oct. 5.—Stockport T.C. Supply of (a) 40 swan neck concrete lighting columns, and (b) 40 lanterns, chokes, condensers for 80 W H.P.M.V. installation. William F. Gardner, Borough Surveyor, Town Hall.

Oct. 8.—Belfast T.C. Supply and installation of electric heaters at Mountcollyer Street and Ariel Street maternity and child health centres, Belfast. City Surveyor's Department (Room 85), City Hall, Belfast.

Oct. 8 — Houghton-le-Spring (Durham) U.D.C. Supply and erection of reinforced concrete lighting columns and fittings in connection with replacement of gas with electric lighting on part of road A.182. Plans by W. H. Smith, Surveyor.

Oct. 8.—Leeds. Supply of electric lamps required by Transport Committee. Documents from A. B. Findlay, General Manager, 1 Swinegate, Leeds 1.

Oct. 8.—Northallerton R.D.C. Pumping plant. (*a*) Osmotherley; two electric motor and pumping sets each of 4,500 gal./hr.; (*b*) Jeater Houses: two sets each of 3,000 gal./hr., all with automatic control gear. Consulting Engineer, A. Brooksbank, 14 The Exchange, Bradford. Deposit £2 2s.

Oct. 9.—Fraseburgh T.C. Conversion of electric street lighting comprising 54 units to sodium lamps. Also supply and erection of concrete lamp standards and sodium lamps along approximately 1½ miles of trunk road A92/A98. Separate contracts. G. S. Stewart is Borough Surveyor.

Oct. 15.—Darlington R.D.C. Two electric motor and centrifugal pumping sets, one of 4,500 gal./hr. and one of 12,000 gal./hr. Apply to Consulting Engineer, A. Brooksbank, 14 The Exchange, Bradford. Deposit £2 2s.

Oct. 17.—Leyton. Conversion of tower hoist at High Rd. baths from manual to electrical operation. Superintendent, Public Baths Dept., High Rd., E.10. (Advertised in this issue.)

Oct. 31.—Brighton T.C. Dismantling the existing passenger lift, and installing a new one at the Town Hall. Borough Engineer and Surveyor, 26-30 King's Road, Brighton.

Nov. 9.—Lincoln. Provision of electrical services in erection of Grantham Technical College. Applications to be submitted to County Architect, J. W. H.

Barnes, County Offices, Sleaford, by Oct. 10.

No date stated.—North of Scotland H.E. Board. Supply, delivery and erection of 11 kV and lower voltage wood pole lines in the north-east of Aberdeenshire, Strichen area. Work divided into three contracts. Apply to Merz and McLellan, Consulting Engineers, 39 Northumberland Street, Edinburgh 3. Deposit £1 1s. for each contract. (See Sept. 20 issue.)

No date stated.—Oswaldtwistle U.D.C. Installation and erection of 50 400 W and 25 135 W h.p. m.v. columns and brackets for 1951-52 lighting scheme. T. D. Manning, engineer and surveyor, Town Hall, Oswaldtwistle. (See Sept. 20 issue.)

No date stated.—Auchterarder T.C. Electrical work in construction of 16 houses in Ruthven Street. Town Clerk is R. M. Young.

No date stated.—Roxburgh. Electrical works for Burnfoot primary school, Hawick. County Architect, County Offices, Newtown St., Boswells.

No date stated.—N. of Scotland H.-E. Board. Electrical installations at Errochty power station, Perthshire, covering lighting, heating and auxiliary cabling. Engineers are Merz and Mc Lellan, 39 Northumberland St., Edinburgh 3. Deposit £2 2s. (Advertised in this issue.)

OVERSEAS

*Details of items marked * may be obtained on application to Room 1076, Board of Trade, Thames House, North Millbank, S.W.1, quoting reference.*

Oct. 11.—New Zealand. Supply of 100 mercury vapour 400 W street lights and 100 tungsten filament 500 W lights all horizontal mounting for Auckland Electric Power Board, Nuffield St., Newmarket. Deposit £50. B.o.T. (Ref. CRE (IB) 70960/51).*

Oct. 12.—S. Rhodesia. Supply of two electrically driven cylinder honing and lapping machines. Gear must be 3 phase, 50 C.P.S., 380/400 V a.c. Secretary of Tender Board, P.O. Box 75, Causeway, Salisbury. B.o.T. (Ref. CRE (IB) 70744/51).*

Oct. 17.—India. Directorate General of Supplies and Disposals requires large quantities of cable to various specifications. B.o.T. (Ref. CRE (IB) 70737/51).*

Oct. 20.—Brazil. Recife Dept. of Ports require sundry machine tools each of which should be equipped with electric motors of 220 × 280 V 50 c/s. B.o.T. (Ref. CRE (IB) 70745/51).*

Oct. 25.—Sydney C.C. A set of three s.ph. aircore concrete embedded reactors, for 33 kV, and 12 cable sealing ends of the porcelain shrouded type, for Bunnerong power station. B.o.T. (Ref. CRE (IB) 70265/51)*.

Nov. 7.—S. Rhodesia. Electricity Dept., Municipality of Umtali, invites tenders for 150 radial wave street light lanterns with 18 in. vitreous enamel reflectors and Edison screw lampholders.

Nov. 21.—Queensland. A number of small 22 kV distribution transformers, to Australian standard specification No. C 61-1946, for State Electricity Commission (for use by Cairns Regional Electricity Board. B.o.T. (Ref. CRE (IB) 70313/51)*.

Nov. 23.—Brisbane. Tenders invited for supervisory control equipment for tramway substations. Town Clerk, City Council, City Hall. B.o.T. (Ref. CRE (IB) 70956/51).*

Nov. 26.—India. Director-General Supplies and Disposals, Shahjaha Rd., New Delhi, requires one all-geared vertical sensitive drilling machine, eight 3¼ ft, one 4 ft and two 5 ft radial drilling machines, all suitable for 400 V 3-phase 50 c/s a.c. supply. B.o.T. (Ref. CRE (IB) 70948/51).*

Dec. 14.—Brisbane. Manufacture and supply of one turbo-alternator set of 30 MW continuous rating, or two sets of this rating, complete with all accessories for City Council, City Hall. B.o.T. (Ref. CRE (IB) 70974/51).*

No date stated.—Ceylon. Tenders to be invited shortly for construction of Stage 11A of the H.-E. scheme at Watawala. Section C of this involves electrical and mechanical plant in extension to Laksapana station and 3 substations including three 12,500 kW alternators, 66 kV, 11 kV and 400 V a.c. switchgear with control gear and cables, 66 kV, 33 kV and 400 V switchgear and oil purifiers, transformers, arc suppression and decoupler coils, voltage boosters, lighting arresters, fire fighting equipment, etc. Section D includes 3 66 kV transmission lines of 18, 18 and 52 miles in length. Applications to Crown Agents for Colonies, 4 Millbank, S.W.1, by Oct. 31. (Advertised in this issue.)

Your Queries — Answered

Electronic church bells, makers of? B.I.—We understand that the Miller Organ Co. Ltd., Timberhill, Norwich, have done work in this direction. (21503)

Lord's controller for lighting sets, makers of? F.D.—J. Lord and Co. Ltd., Pontefract. (21505)

"Radiamp" control unit, makers of? W.L.T.—Radiamp Co. Ltd., 1 Farningham Road, N.17. (21506)

"Domesticold" refrigerators, makers of? J.J.—H. D. Milburn Ltd., Stewart Street, Wolverhampton. (21509)

Arc welding equipment for welding foil approx. 0·003 in. thick, makers of? E.S. and A.R.—Try New Process Welders Ltd., 76 Victoria Street, S.W.1; and Westminster Engineering Co., Willesden Junction, N.W.10. (21511)

"Alder" washboilers, makers of? F.R.—Alder Electrical Appliances Ltd., Rushworth Street, Burnley. (21512)

"B and Y" appliances, makers of? L.T.—Berkeley and Young Ltd., Tyseley, Birmingham. (21513)

"Ace" washing machine, makers of? W.—J. Rowell and Son Ltd., Boyd Street, Newcastle-upon-Tyne. (21515)

"Krivert" gaslighter, makers of? L.M.—Belark Tool and Stamping Co. Ltd., 33 Sussex Place, W.2. (21516)

The above are selected from questions we have answered this week. If you have a query, send it to us.

TRADE NOTES

Changes of Address. Correspondence for the chief accountant of the Eastern Electricity Board should now be addressed to Wherstead, Ipswich.

As from October 1, the head office and London area sales office of Northern Aluminium Co. Ltd. will be at Bush House, Aldwych, W.C.2. Telephone: Temple Bar 8430.

Acquisition. Agreement has been reached for the acquisition by Tube Investments Ltd., of the New Conveyor Co. Ltd. of Smethwick, manufacturers of all types of mechanical handling equipment. The concern will continue to operate as a separate entity with Mr. W. R. Purnell as chairman and managing director.

New 'Phone No. The telephone number of the Wear Sub-Area headquarters of the North Eastern Electricity Board, at Dunning St., Sunderland, has been changed to Sunderland 57581.

PRICES OF CABLE METALS AND OTHER MATERIALS
(at Tuesday night)

	£ s. d.	New York price
COPPER, electrolytic	227 0 0	£220 0 0
LEAD, good soft pig (foreign)	180 0 0	136 0 0
" " " " "English" quality	181 10 0	
Tin (99-99.75—) ... ...(Cash)	952½-955	[illegible]
" (3 months)	907½-910	[illegible]
ALUMINIUM, commercial purity (del.)	124 0 0	—
ZINC	190 0 0	140[illegible]0 0
ARMOURING:		
Galv. Steel Wire (0.104 in.)	55 5 0	—
Mild Steel Tape (0.04 in.)	32 5 0	—

CONTRACTS PLACED

Bradford. Electrical installation in 162 houses on Buttershaw estate. J. Carter and Sons Ltd., £4,832.

Forfar. Fluorescent lighting in Castle Street and East and West High Street, General Electric Co. Ltd., £3,698.

Torquay T.C. Supply and installation of diesel-driven electric generating plant to supply 4·5 kW at 230 V d.c. C. G. Ellis.

Swansea T.C. Electrical installation at Mayhill School, Hartley Electromotives Ltd., £1,868.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London W.C.2.

Company Limited by Guarantee

Institute of Industrial Administration. To provide for members, associates and students of the British Institute of Management the means of attaining significant professional qualifications in the science and art of management, and for that purpose to acquire the assets of the society known as Institute of Industrial Administration, etc. The income and property of the institute, whencesoever derived, shall be applied solely towards the promotion of its objects. Council: Not named. Subs.: E. Meigh, 14 Kent Ave., W.13; W. T. Davies, 3 Middle Temple Lane, E.C.4, barrister-at-law; and six others.

Beca (Engineers) Ltd., Lime St., Ellesmere Port, Ches. Welding engineers, welders, silver and lead solderers, etc. Cap.: £1,500. Dirs.: J. Bottome, J. Elliott and J. Catchpole.

Meredith Electrical Services Ltd., 26/7 Conduit St., W.1. To take over (1) business of electrical contractors and wireless specialists carried on at 175 Plashet Grove, E.6, by Harold C. Meredith, and (2) business of fancy goods dealers carried on at St. Osyth, Essex, by the said H. C. Meredith. Cap.: £1,000. Dirs.: H. C. Meredith and Mary A. Meredith.

Beadenco Ltd., "The Lynch," Uxbridge, Mdx. Precision, production, motor, electrical and general engineers, etc. Cap.: £1,500. Dirs.: L. A. Beadle and Elsie D. Beadle, and A. C. Bentall.

G.K. Distributors (Ashton) Ltd., 11 Fountain St., Halifax. Wholesalers and retailers of electrical components, etc. Cap.: £1,000. Dirs.: To be appointed by subs. Subs.: Barbara M. Sharp and Joyce Crossley.

Electric Installations (High Wycombe) Ltd., 78 Desborough Rd., High Wycombe. Cap.: £4,000. Permt. dirs.: C. G. Davies, C. J. Davies, F. R. Walker and H. C. D. Ing.

Instruments and Controls (J. L. Record) Ltd., 3 Sandiway Place, Manchester Rd., Altrincham, Ches. To take over business of a manufacturer and repairer of and dealers in measuring instruments, control gear and electrical and electronic apparatus and accessories carried on at Altrincham, Cheshire, by John L. R. Record. Cap.: £3,000. Dirs.: J. L. R. Record (permanent gov. dir.) and R. E. Everett.

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Eagle Refrigeration Co. Ltd., 376 Grays Inn Road, W.C.1. David Morgan, 100 Park St., W.1, has been appointed liquidator with committee of inspection.

William Orr and Co., electrical contractors of 58 Boswall Parkway, Edinburgh, ceased trading as from Sept. 1. Winding-up is in the hands of A. Murray and Co., C.A., 4 Rothesay Place, Edinburgh.

BANKRUPTCY ACTS

Dividends

West Bromwich. Ernest Maurice Swift, electrical engineer of 10 Joinings Bank, Langley Green, Worcester. Supplemental dividends of 10d. in £ payable at office of Official Receiver, 37 Temple Street, Birmingham 2, on October 3.

Liverpool. Edna E. Jones, lampshade manufacturer, trading as "Edna Ward" at 19 Duke Street. First and final dividends of 3s. 5d. in £ payable at 41 N. John Street, Liverpool 2, on October 2.

Intended Dividends

Liverpool. John Manley, radio dealer and engineer, trading at 457-9 Stanley Road, Bootle. Last day for receiving proofs, October 3. Trustee is Silas Oliver Henry, 5 Rumford Place, Liverpool.

Receiving Order

Derby. Hector W. Sharp, electrical and radio engineer trading as "Willdays" at 178 Osmaston Rd., Derby. Date of receiving order, Sept. 18. First meeting takes place tomorrow (Friday) at Official Receiver's Office, 22 Regent St., Park Row, Nottingham, at 11.30 a.m. and public examination on Dec. 18 at Court House, St. Peter's Churchyard, Derby, 10 a.m.

BUSINESS PROSPECTS

HOME

Auchtermuchty (Fife) T.C. Tenders in all trades invited in connection with erection of 20 houses in seven blocks. L. A. Rolland, The Albion House, Shorehead, Leven.

Barnet U.D.C. Erection of 33 flats at Bells Hill. Engineer and Surveyor, Municipal Offices, Wood Street.

Basingstoke T.C. Plans submitted for approval of a secondary school for girls in Cliddesdon Road.

Billingham. It has been proposed that a primary school be built on Roseberry Rd. estate.

Birkenhead T.C. It is proposed to build 24 houses at The Priory, 20 each at Grangefield and in Fairfield Road, and 12 in Quigey Street.

Birmingham. Approval sought for extensions to Selly Oak Hospital, new accommodation at Woodlands Hospital, and reconstruction work at Winson Green Hospital for Regional Hospital Board.

Boston T.C. Geest Industries Ltd., White House Chambers, Spalding, are planning extensions to their factory in Marsh Lane.

Bradford. Scheme approved for alterations to St. George's Hall. Estimated cost is £35,000 and work includes heating and electrical installations. A start will probably be made early next year.

Brentford and Chiswick B.C. Erection of (*a*) 55 flats at St. Thomas's, and (*b*) of 24 flats at Edensor Gardens. Separate contracts. Details from Borough Engineer and Surveyor, Town Hall, Chiswick, W.4.

Carshalton (Surrey) U.D.C. Erection of nine shops and 11 flats at the Mount. J. W. Wright, clerk, District Council Offices, The Grove.

Cheshire. Twelve new schools have been included in 1951-52 building programme and sketch plans approved.

Chester R.D.C. Erection of 12 houses at Barrow. T. C. R. Eaton, 16 White Friars, Chester.

Cumberland. Secondary school is to be built at Maryport. Eight police houses and two stations to be built on various sites. County Architect is J. H. Haughan, Portland Sq., Carlisle.

Driffield (Yorks) U.D.C. Erection of 40 houses on Northfield Road estate. A. Hornby, Clerk, Council Offices, Eastgate, Louth.

Dublin. Department of Industry and Commerce are inviting tenders for erection of a building to house standby electric generating plant at Shannon Airport. The Department is in Kildare Street, Dublin.

Easington R.D.C. Forty-four houses are to be built at Murton, S. Helton and Wingate.

Edinburgh. Dean of Guild Court has approved erection of 498 houses in Drylaw Mains South housing area at estimated cost of £570,039.

Falkirk. Dean of Guild Court has approved erection of following houses: 24 at Camelon, 80 on Windsor Road site, and 71 on two sites at Bainsford.

Fife. Approval received for erection of schools at Glenrothes, Dunfermline, Kirkcaldy, Rosyth and Comrie. Total estimated cost, £726,022.

Halifax T.C. Erection of (*a*) 84 flats in Grantham Road, and (*b*) 52 flats in Heap Street. Separate contracts. Applications immediately to Borough Engineer, Crossley Street.

Haverfordwest R.D.C. Plans in hand for erection of 40 houses each at St. David's, Solva, and Letterston.

Hawick T.C. Council has approved installation of electricity in 184 houses at Greenheads, Cheviot Road, and Oliver Park, at an estimated cost of £3,335.

Hertfordshire. Construction of junior and infants' schools at Boreham Wood. Names to County Architect, County Hall, Hertford.

Holywell U.D.C. Construction of 38 houses in two groups of 20 and 18 at Greenfield. Council's Architect, E. C. Roberts, Earl Chambers, Mold.

Hornsea (York) U.D.C. It is proposed to build 20 houses on Hornsea Burton estate and later a further 80 houses.

Middlesbrough T.C. Erection of 134 houses in five groups at Berwick Hills. Borough Engineer and Surveyor.

Northumberland. Home for old people to be built in King's Ave., Morpeth. County Architect, C. C. Brown, County Hall, Newcastle.

North Riding. An infant welfare centre is to be erected at Richmond. Estimated cost is £13,350.

Nottingham. Construction of junior school on Strelley estate. City Engineer and Surveyor, Guildhall.

Onchan (I.o.M.). Village Commissioners have approved erection of 44 houses at Ballachrink.

Smethwick T.C. Construction of a block of 28 dwellings in Wellington St. and Foundry Lane. D. M. Waite, Borough Engineer and Surveyor, Council House.

Somerset. Secondary schools to be built at Portishead and Norton Radstock, Writhlington, at total estimated cost of £322,740.

Strood (Kent) R.D.C. Construction of 26 houses and four bungalows at Meopham. Engineer and Surveyor, D. P. Terry, Council Offices, Frindsbury Hill.

St. Helens T.C. Erection of 60 houses on Derbyshire Hill estate, and 50 on East Lancashire Road estate. M. Ward, Borough Engineer, Town Hall. Separate tenders invited.

Stirlingshire. It is proposed to erect 44 houses at Bonnybridge.

Stretford. Erection of 20 houses on Radstock Rd. site. A. H. Perry, Borough Surveyor, Town Hall.

Thurrock U.D.C. Tenders invited for proposed branch library in Blackshots Lane. H. Hawkes, Engineer and Surveyor, Council Offices, Palmer's Avenue, Grays.

Upton-on-Severn (Worcs) R.D.C. Erection of 28 houses at Kempsey. Pemberton and Bateman, 21 Vine Street, Evesham.

Wakefield. Erection of 114 houses on Kettlethorpe estate. Documents from Town Hall.

Whitby U.D.C. Erection of 32 houses in Helredale Road. Council's Architect, Peacock and Bewlay, 224 Hagley Road, Edgbaston, Birmingham.

OVERSEAS

Cuba. Agencies for British exporters and manufacturers of electric toasters and irons are being sought by Skarbrevik and Co., Monte 65, Havana.

New Zealand. Selwyn Aickin Ltd., Ferry Buildings, Auckland, wish to obtain agencies of U.K. manufacturers of domestic electric appliances and light globes.

South Africa. African Swiss Import and Export Co. (Pty.)

Ltd., P.O. Box 240, Cape Town, wish to represent U.K. manufacturers of diesel-electric generator sets for power and light.

U.S.A. John L. Underwood Co. Inc., 555 Whitehall Street, S.W. Atlanta, Georgia, are inquiring for supply of air-cooled transformers for control circuits, electrical relays, time switches and centrifugal blowers for light-duty ventilation and air conditioning.

Dibert, Bancroft and Ross Co., Ltd., 3400 Tulane Ave., New Orleans, would like quotations for a horizontal boring mill, standard high speed with electric pendant control. B.o.T. (Ref. CRE (IB) 70694/51)

Also United Liquor Co., 819 Jefferson Ave., St. Louis, wish to import small electrical appliances.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

LEC with design. 683,381. Class 11. Refrigerators. Longford Engineering Co. Ltd., Shripney Works, Bognor Regis, Sussex.

Red Rose. 699,198. Class 7. Portable electric welding machines. G. K. Lancaster (London) Ltd., 50 George St., Croydon.

Vacuclad. 698,336. Class 6. Wire of common metal coated with copper. Vactite Wire Co., Ltd., 24 Queen Anne's Gate, S.W.1.

Neofer. B698,374. Class 9. Magnetic cores. Neosid Ltd., 31/33 Hyde Way, Welwyn Gdn. City, Herts.

Thermakozy. With design. B698,665. Class 9. Electric tea cosies. W. A. Battenberg and T. N. Battenberg, trading as Oliver Battenberg and Co., 6 Gt. Winchester St., E.C.2.

Manometron. B699,232. Class 9. Mechanisms embodying a combination of manometric and electronic apparatus for use in supervising or controlling the operations of machinery. B. G. (London) Ltd., 17 Stratford Place, W.1.

Saucepan Special. 694,369. Class 9. Electric batteries, cells and accumulators; wireless apparatus operated by batteries, etc., and torch cases. Ever Ready Co. (Gt. Britain) Ltd. Hercules Place, Holloway, N.7.

Collaro. B700,577. Class 10. Lamps for medical and curative purposes. Collaro Ltd., Ripple Works, By-Pass Rd., Barking.

MEETINGS TO NOTE

THURSDAY, SEPT. 27

INCORP. PLANT ENGRS. (S. Yorks Branch).—"Electronics in Industry," by B.T.H. Ltd., Grand Hotel, Sheffield, 7.30 p.m.

I.E.S. (Nottingham Centre).—Annual luncheon and induction of chairman. Victoria Station Hotel, 5.30 p.m.

I.E.S. (Bradford Group).—"Lighting of Trains and Public Service Vehicles." S. Anderson and C. Dykes Brown. Y.E.B., 45-53 Sunbridge Rd., 7.30 p.m.

PURCHASING OFFICERS' ASSCN. Three-day conference opens at Craigside Hydro, Llandudno.

FRIDAY, SEPT. 28

I.E.S. (Leeds Centre). Chairman's address.—J. Sewell, Guildford Hotel, The Headrow, 7 p.m.

MONDAY, OCT. 1

A.S.E.E. (Leeds Branch).—"Research on Lamps and Lighting." R. V. Mills. Lighting Service Bureau, 7.30 p.m.

A.S.E.E. (N.E. London Branch).—"Modern Installations." W. F. Parker. Angel Hotel, Ilford, 8 p.m.

A.S.E.E. (Sheffield Branch).—"Television Lecture and Demonstration." C. O. Birtles. Royal Victoria Station Hotel, 7.30 p.m.

I.E.S. (Sheffield Centre).—Chairman's address by G. L. Tomlinson. The University, Western Bank, 6.30 p.m.

SOC. OF ENGRS.—"Application of Electronic Instruments to Industry." S. F. Smith. Burlington House, London W., 5 p.m.

I.E.E. (Mersey and N. Wales Centre).—Chairman's address by E. W. Ashby. Liverpool Royal Inst., Colquith St., 6.30 p.m.

I.E.E. (S. Midland Supply and Utilization Group).—"Design of Power Transformers to Withstand Surges due to Lightning." A. T. Chadwick, J. M. Ferguson, D. H. Ryder and G. F. Stearn. Imperial Hotel, Birmingham, 6 p.m.

I.E.E. (N. Staffs sub-centre).—Chairman's address by J. E. Bowl. King Edward Grammar School, Stafford, 7 p.m.

TUESDAY, OCT 2

I.E.E. (N.W. Centre).—Chairman's address by G. R. Polgreen. Engrs'. Club, Albert Sq., Manchester, 6.30 p.m.

I.E.E. (Rugby sub-centre).—Chairman's address by J. H. Walker. College of Technology and Arts, 6.30 p.m.

INCORP. PLANT ENGRS. (London Branch).—"Planned Maintenance." J. T. Bromley. E.L.M.A., Savoy Hill, 7 p.m.

I.E.S. (Stoke-on-Trent Group).—"Lighting of the Houses of Parliament." R. L. C. Tate. 31 Kingsway, 6 p.m.

A.S.E.E. (Newcastle Branch).—"Wheels behind the Wheels." Tyne Hotel, Hood St., 7.30 p.m.

A.S.E.E. (W. London Branch).—"Automatic Power Factor Correction." J. Orr. Windsor Castle Hotel, Hammersmith, 7.30 p.m.

SOC. OF RELAY ENGRS.—"Television Relay by Wire." F.M.I. Institute, 10 Pembridge Sq., W.2., 2.30 p.m.

WEDNESDAY, OCT. 3

A.S.E.E. (N. London Branch).—"Measurement and Quantities." W. H. Brooks. Three Jolly Butchers Hotel, Wood Green, N.22, 8.15 p.m.

INSTN. OF HEATING AND VENTILATING ENGRS. (E. Midlands Branch).—"Refrigeration." F. L. Pettman. Victoria Station Hotel, Nottingham, 6.30 p.m.

I.E.S. (Newcastle Centre).—Chairman's address by W. H. Dodgson. Minor Durrant Hall, Oxford St., 6.15 p.m.

I.E.E. (Tees-Side sub-centre).—Chairman's address by D. B. Hogg. Cleveland Scientific and Tech. Inst. Middlesbrough, 6.30 p.m.

I.E.E. (Southern Centre).—Chairman's address by A. L. Ashton. British Elec. House, 111 High St., Portsmouth, 6.30 p.m.

THURSDAY, OCT. 4

INCORP. PLANT ENGRS. (Peterborough Branch).—"Manufacture of Electric Lighting Fittings." Eastern Gas Board, Church St., 7.30 p.m.

I.E.S. (Leicester Centre).—"Lighting of the new House of Commons." E. Midlands Elect. Bd., Charles St., 6.30 p.m.

I.E.S. (Nottingham Centre).—Chairman's address by C. S. Caunt. E. Midlands Elect. Bd., Smithy Row, 5.30 p.m.

I.E.S. (Exeter Group).—"Stage Lighting." J. W. Strange. The Providence Hall, Northernhay St., 7 p.m.

A.S.E.E. (S. London Branch).—"Gyroscopes." W. J. Spencer. Cafe Royal, North End, Croydon, 8 p.m.

FRIDAY, OCT. 5

INCORP. PLANT ENGRS.—Scottish Conference at Dunblane opens. Continues to Oct. 7.

INST. OF X-RAY TECHNOLOGY.—"Transformer Oil." E. C. Montgomery. I.E.E., Savoy Place, W.C.2. 7 p.m.

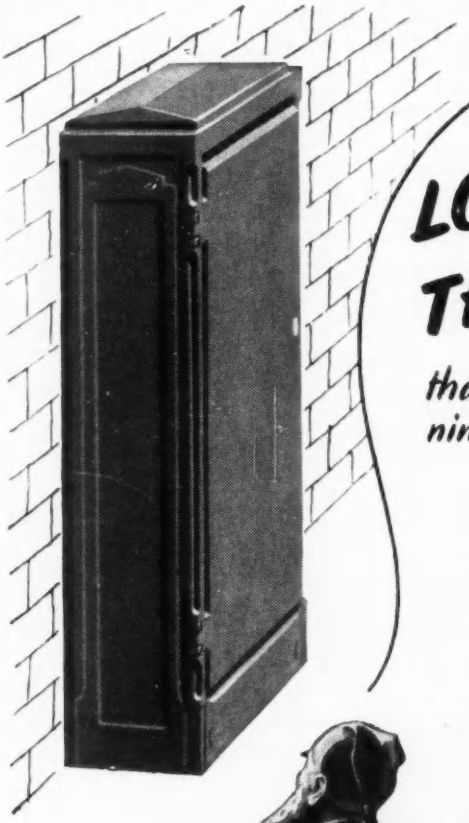
ELECT. TRADES COMMERCIAL TRAVELLERS' ASSOC.—Ladies Night at Cafe Royal, London.

I.E.S. (Bath and Bristol Centre).—"Stage Lighting." J. W. Strange. S. W. Elect. Board, Colston Ave., Bristol, 5.30 p.m.

I.E.S. (Huddersfield Group).—"Lighting for High Speed Photography and Cinematography." J. Hadland. Elect. Showroom, Market St., 7.15 p.m.

MANCHESTER ASSOCIATION OF ENGINEERS.—Inaugural address by President, F. Buckingham. Engrs'. Club, Albert Square, 6.30.

THERE'S ALWAYS ROOM FOR A HENLEY DWARF



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And see how snugly it fits against that wall! You'll never have any bother finding room for a Henley Dwarf Pillar. If you want to you can build it into the wall and it will still be just as accessible.

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No. 4 . . . 6″ Scale Switchboard Instruments

Weston 6″ scale switchboard instruments combine the sensitivity of a laboratory instrument with the robust qualities necessary in a switchboard pattern. The range includes the Model S.57, which is supplied as a D.C. Microammeter, Milliammeter, Ammeter or Voltmeter: The S.58 which incorporates a thermocouple for the measurement of H.F. currents and is available as a Milliammeter or Ammeter: The Model S.59, incorporating a metal rectifier for the measurement of A.C., is supplied as a Milliammeter or Voltmeter and the Model S.60 is a Moving Iron Instrument for A.C. or D.C. measurement and is available as a Milliammeter, Ammeter or Voltmeter. The illustration shows the Model S.60 in the projecting type case. All models are available in either projecting or flush type moulded Bakelite cases. Further information and full details of the ranges supplied available on request.

WESTON

Electrical Measuring Instruments

SANGAMO WESTON LIMITED

Enfield, Middlesex. Tel: Enfield 3434 (6 lines) & 1242 (4 lines). Grams: Sanwest, Enfield

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CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WANTED · FOR SALE WORK WANTED

Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia St., London W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 42s. per inch, and all other classified advertisements at 3s. 0d. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.

TENDERS INVITED

GOVERNMENT OF CEYLON

CEYLON HYDRO-ELECTRIC SCHEME, STAGE 11A—25,000 kW

TENDERS. The Government of Ceylon will call for tenders shortly for the construction of Stage 11A of the Hydro-Electric Scheme at Watawala.

Under Stage 11A a seasonal storage reservoir will be provided by the construction of a mass concrete dam, 730 feet long, 130 feet high near Castlereagh about 5 miles upstream from the existing Norton Dam, so that the stored water can be released under control.

Two further pipelines about 5,444 feet long will be provided. Each pipe will be 48 inches diameter at the head diminishing in diameter to 36 inches at the terminal anchor blocks where the two 36 inch pipes will bifurcate into two to form three 33 inch pipes connecting to the turbine inlet valves.

The electrical and mechanical plant is to be erected in an extension to the existing Laksapana Power House near Watawala and in substations at Nuwara Eliya, Kurunegala and Colombo; they include three waterwheels for direct coupling to three 12,500 kW alternators which latter should also be supplied, self-closing valves; 66 kV, 11 kV and 400 V a.c. switchgear together with control gear and cables for power house; 66 kV, 33 kV and 400 V switchgear and oil purifiers for substations and the receiving station; transformers, arc suppression and de-coupler coils, voltage boosters, lightning arrestors, fire-fighting equipment, etc.

A 66 kV transmission line with steel towers and cadmium copper conductors about 18 miles long will be erected from Norton to Nuwara Eliya and another about 18 miles long from Peradeniya to Kurunegala and a third about 52 miles long from Laksapana to Colombo.

The work enumerated above will be carried out in four sections, namely:—

Section A—Mass Concrete Dam at Castlereagh.

Section B—Pipelines.

Section C—Electrical and Mechanical Plant.

Section D—Transmission Lines.

Separate tenders will be invited for each of the four sections. A Memorandum setting out further details of the work involved will be issued to prospective tenderers on application to the Crown Agents for the Colonies, 4 Millbank, London S.W.1. Firms which propose to tender for one or more sections of the work should apply to the Chief Engineer and Manager, Department of Government Electrical Undertakings, Ceylon, through the Crown Agents for the Colonies, 4 Millbank, London S.W.1, on or before October 31, 1951, setting out their experience, resources, etc. The capability of these firms to undertake the work will be examined by a Board constituted for the purpose and such firms as are considered satisfactory will be requested to tender. (M 214)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

ERROCHTY DAM AND POWER STATION LIGHTING, HEATING AND AUXILIARY CABLING INSTALLATION

TENDERS are invited for the electrical installations at Errochty Power Station, Perthshire, covering lighting, heating and auxiliary cabling.

The tender documents may be obtained on application to the Engineers, Messrs. Merz and McLellan, 39 Northumberland Street, Edinburgh 3, upon payment of a fee of two guineas (returnable).

The Board do not bind themselves to accept the lowest or any tender.

W. D. D. FENTON,
Secretary.

16 Rothesay Terrace,
Edinburgh 3. (M 213)

BOROUGH OF LEYTON

TENDERS are invited from electrical contractors for the conversion of a TOWEL HOIST at the High Road Baths from manual to electrical operation.

Particulars of requirements may be obtained from the Superintendent, Public Baths Department, High Road, Leyton, E.10. Tenders must be sent to the undersigned to arrive not later than Wednesday, October 17.

The Council do not bind themselves to accept the lowest or any tender.

D. J. OSBORNE,
Town Clerk.

Town Hall,
Leyton E.10. (M 309)

APPOINTMENTS VACANT

BRITISH ELECTRICITY AUTHORITY

RESEARCH BRANCH HEADQUARTERS

APPLICATIONS are invited for the following appointments in the Research Branch of the Chief Engineer's Department in London.

SECOND ASSISTANT ENGINEER. Candidates should hold a First or Second Class Honours Degree in Engineering or Physics, and should have a good, although not necessarily specialised, knowledge of modern generation or transmission practice.

The salary for the appointment, which is superannuable, will be £755 per annum to £1,017 per annum, according to qualifications and experience, rising to a maximum of £1,120 per annum inclusive of London allowance.

GENERAL ASSISTANT ENGINEER. Candidates should hold a First or Second Class Honours Degree in Engineering, and preference will be given to those with some experience of generation or transmission of power.

The salary for the appointment, which is superannuable, will be £490 to £624 per annum, according to qualifications and experience, rising to £689 per annum inclusive of London Allowance.

Applications, stating age, present salary and giving full details of qualifications and experience, should be forwarded to D. Moffat, Director of Establishments, British Electricity House, Great Portland Street, London W.1, not later than October 13, 1951.

Please quote reference AE/205. (M 202)

CROWN AGENTS FOR THE COLONIES

DISTRIBUTION SUPERINTENDENT required by the Government of Sierra Leone for the Electricity Branch of the Public Works Department for one tour of 18 to 24 months with prospect of permanency. Salary according to qualifications and experience, in scale £723 a year rising to £1,060 a year (including expatriation pay and temporary allowance). Outfit allowance £60. Free passages. Liberal leave on full salary. Candidates must have served an apprenticeship with a public supply undertaking and have had several years' practical experience in the installation of underground cable systems at 11kV and 3.3 kV and 400/300 V and be thoroughly conversant with fault location methods. Experience with the erection and operation of overhead h.v. and l.v. lines would be an advantage. Candidates should also have had experience in the erection and maintenance of switchgear (h.v. and l.v.) and power transformers, and be able to plan improvements to and development distribution systems. Apply at once by letter, stating age, full names in block letters and full particulars of qualifications and experience, and mentioning this paper, to the Crown Agents for the Colonies, 4 Millbank, London, S.W.1, quoting M.28556.B. on both letter and envelope. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. (M 220)

KENT COUNTY COUNCIL

APPLICATIONS are invited for appointment in the Buildings Department of a SENIOR ENGINEERING ASSISTANT (Electrical) at a salary in A.P.T. Grade VI (£645-£710).

Applicants must be Corporate Members of the Institution of Electrical Engineers and be capable draughtsmen with good experience in the preparation of schemes, specifications and estimates for all classes of electrical installation work. The duties will include the preparation of drawings, inspection of premises and supervision of installations.

Applications, on forms obtainable from the County Architect, Springfield, Maidstone, must be delivered to him within 14 days of the appearance of this advertisement.

W. L. PLATTS,
Clerk of the County Council.

County Hall, Maidstone.
September 18, 1951. (M 211)

MIDLANDS ELECTRICITY BOARD

Central Gloucestershire Sub-Area

FIRST ASSISTANT DISTRICT CONSUMERS' ENGINEER (GLOUCESTER)

APPLICATIONS are invited for the above post in the Gloucester District of the Central Gloucestershire Sub-Area.

Applicants should have had wide experience in all branches of distribution work, including electrical contracting, preparation of estimates, planning and supervision of practical work. The duties would include negotiations with domestic, commercial and industrial consumers. Appropriate technical qualifications will be considered an advantage.

The appointment will be in accordance with N.J.B. conditions and the salary will be Class "E," Grade 6, £627 p.a.

Applications, stating age, education, qualifications and experience, should be forwarded within 14 days to D. Holt, Manager, Central Gloucestershire Sub-Area, Midlands Electricity Board, Gloucester.

A. STEPHENS,
Secretary.

September 18, 1951. (M 198)

MIDLANDS ELECTRICITY BOARD

South Staffordshire and North Worcestershire Sub-Area

APPLICATIONS are invited for the position of DEMONSTRATOR in the Wednesbury District.

Applicants must have had a good general education, and the possession of a recognised diploma in Domestic Science and Electrical Housecraft will be considered an advantage. Candidates must be able to conduct lecture demonstrations both in the service centres and on consumers' premises, and to advise consumers on the selection and use of electrical apparatus.

Salary and conditions of service will be in accordance with the National Joint Council, Grade 1, within the range £310-£350 p.a. with further progress to £390 p.a., dependent upon a certificate of capability.

The successful applicant will be required to contribute to the B.E.A. and Area Boards' Superannuation Scheme, if eligible.

Applications, in writing, stating age, education qualifications, details of training and subsequent experience, should be forwarded within seven days to the Sub-Area Manager (Ref. C.W.), Midlands Electricity Board, Toll End Road, Tipton, Staffs. (M 197)

LONDON ELECTRICITY BOARD

TECHNICAL ASSISTANT
DESIGN AND PLANNING BRANCH

APPLICATIONS are invited for the above position at South Eastern Sub-Area Headquarters, Woolwich, S.E.18.

Applicants should have received a sound general technical and engineering training to Graduate I.E.E. standard. They should have had experience in the design of modern h.v. and l.v. networks, and preferably have a knowledge of the operation, maintenance and construction of such networks, together with experience in the preparation of estimates.

The post is graded under Schedule A of the National Joint Board agreement (February 17, 1950) as 3rd Assistant Engineer Class "G," Grade 10, £565 19/- p.a., rising to £589 1/- p.a., inclusive of London allowance. The classification shown is that applicable to last year (1950/51), and any revision of classification for the sub-area, for the current year, arising when the figures for the whole area are available, will be applied to this post retrospectively.

Application forms obtainable from Establishments Officer, 46 New Broad Street, E.C.2, to be returned duly completed within seven days of receipt. Please enclose addressed foolscap envelope and quote ref: V/1320/T on all correspondence. (M 170)

BRITISH ELECTRICITY AUTHORITY

London Division

ELECTRICAL DIAGRAM DRAUGHTSMAN

APPLICATIONS are invited for the above position.

Applicants should be experienced in originating and checking the associated diagrams and protective systems for main generating plant in power stations and substations. They should also possess, or be qualifying for, the Higher National Certificate, or equivalent, and practical training will be an added advantage.

Salary and conditions of service in accordance with N.J.B. Schedule D, Grade 6, plus London Allowance, i.e. £400 to £525 per annum.

The post is superannuable.

Applications, stating age, qualifications and experience, should be addressed to the Divisional Secretary, British Electricity Authority, London Division, Ergon House, Horseferry Road, Westminster S.W.1, to be received within 14 days of the appearance of this advertisement.

J. N. WAITE,
Divisional Controller.
(M 221)

MIDLANDS ELECTRICITY BOARD

North Staffordshire Sub-Area

APPOINTMENT OF SECOND ASSISTANT DISTRICT ENGINEER

APPLICATIONS are invited for the position of Second Assistant District Engineer at the Stoke-on-Trent South East District.

Candidates should be experienced in the operation and maintenance of distribution networks and substations of voltage up to and including 11 kV. Appropriate technical qualifications will be considered an advantage.

The salary and conditions of service will be in accordance with the National Joint Board Agreement, and the salary will be Class "E," Grade 7, £579 to £609 per annum.

Applications, stating age, experience and present salary, should be forwarded within fourteen days to Mr. J. A. P. Firth, District Manager, Midlands Electricity Board, 59-61 Market Street, Longton, Stoke-on-Trent.

A. STEPHENS,
Secretary.

September 14, 1951. (M 200)

BRITISH ELECTRICITY AUTHORITY

SENIOR DRAUGHTSMEN
DRAUGHTSMEN
TRACERS
CHIEF ENGINEER'S DEPARTMENT

APPLICATIONS are invited for the following vacancies in the Drawing Office at Headquarters in London: SENIOR DRAUGHTSMEN and DRAUGHTSMEN with experience in one of the following:

(a) Design of reinforced concrete structures and/or light reinforced concrete foundations, or;
(b) Generating station layout, particularly project.

TRACERS, with experience in the above or general engineering work.

Salary will be in accordance with age and experience within the following ranges, which include London Allowance: Senior Draughtsmen, Grade 4, £630 to £735 per annum, and Grade 5, £525 to £630 per annum; Draughtsmen, Grade 6, £400 to £525 per annum; Tracers, £135 at 16 rising to a maximum of £374 per annum.

Application forms may be obtained from the Secretary's Office (Establishments), Applications Section, British Electricity House, Great Portland Street, London W.1, and should be completed and returned to D. Moffat, Director of Establishments.

Please quote reference AE/204. (M 203)

BRITISH ELECTRICITY AUTHORITY

Eastern Division

APPLICATIONS are invited for the following appointment :—

JUNIOR ENGINEER—Brimsdown Generating Station.

Salary in accordance with Clause 35 of the N.J.B. Agreement, Schedule A, Class "J," Grade 18, £375 to Grade 14, £478 per annum plus London weighting.

Preference will be given to applicants who have had previous experience in a generating station and who have reached the standard of the Ordinary National Certificate in Electrical Engineering or its equivalent.

The appointment will be superannuable in accordance with the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications, stating age, experience and present position should be sent to the Divisional Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, to arrive not later than October 6, 1951. Envelopes should be endorsed "Junior Engineer—Brimsdown."

W. N. C. CLINCH,
Controller.

Northmet House,
Southgate, N.14. (M 172)

BRITISH ELECTRICITY AUTHORITY

London Division

GROUP EFFICIENCY AND TESTING ENGINEER

APPLICATIONS are invited for the position of Efficiency and Testing Engineer (Group 11), Group Office, at Lancaster Place, W.C.2.

Candidates should have a degree in engineering of the requisite technical qualifications for corporate membership of the Institution of Mechanical Engineers or the Institution of Electrical Engineers. They should have experience in carrying out tests on steam and mechanical plant and heat exchange apparatus and also be capable of preparing reports and interpreting the results of such tests.

The salary will be in accordance with N.J.B. Schedule C, Class "AX EX," Grade 2, i.e., £789/12/- p.a. to £1,044/15/- p.a., including London allowance.

ASSISTANT ENGINEERS (EFFICIENCY AND TESTING)

Applications are invited for positions as Assistant Engineers (Efficiency and Testing) attached to Groups.

Candidates should have a good technical education and experience of the testing and/or operation of the mechanical plant in a power station.

The appointment will be in the General Assistant Engineer Grade, and the commencing salary will be in accordance with N.J.B. Schedule C, Class "AX EX," Grade 8, i.e., £462 p.a. to £673/1/- p.a., including London allowance.

Applications should state age, qualifications and experience and be addressed to the Divisional Secretary, British Electricity Authority, London Division, Ergon House, Horseferry Road, S.W.1, and be received not later than 14 days after the appearance of this advertisement.

J. N. WAITE,
Divisional Controller.
(M 168)

BRITISH ELECTRICITY AUTHORITY

Yorkshire Division

GROUP CHEMISTS

APPLICATIONS are invited for positions as Group Chemists within the Yorkshire Division.

Applicants should hold a University degree in Chemistry or its equivalent, and must have had a wide experience of modern power station chemical practice. A specialised knowledge in any branch of applied chemistry will be considered advantageous.

The successful candidates will be responsible to the Divisional Chief Chemist for the control of the chemical services within a group of power stations and will be situated at one of the power stations within the Group.

Conditions of service and commencing salary will be in accordance with the N.J.B. Agreement, Grade 2, Schedule "C," £752-£884 p.a., rising ultimately to £966 per annum. The appointments will be subject to the provisions of the Authority's Superannuation Scheme.

Applications should be made on forms obtainable from the Divisional Secretary, British Electricity Authority, Yorkshire Division, British Electricity House, St. Mary's Road, Leeds, 7, to whom completed forms should be returned within 14 days of the appearance of this advertisement.

Envelopes should be endorsed "Group Chemist."

G. A. VOWLES,
Divisional Controller.
(M 175)

SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the positions of SECOND ASSISTANT ENGINEERS in the Planning and Development Sections of the Sub-Area Engineers' Staffs in the Board's Eastern, Central and West Central Sub-Areas at Cwmbran, Cardiff and Pforestfach (Swansea). Candidates should have had a sound engineering training and experience of distribution work in urban, industrial and rural areas. Experience in planning work is essential and some experience in d.c./a.c. changeover work desirable. Corporate membership of the Institution of Electrical Engineers or equivalent qualification will be an advantage.

The salaries for the positions will be in accordance with the National Joint Board Schedule for the electricity supply industry as follows:

Eastern Sub-Area, Class "J", Grade 7, £736/£753/£770.
Central Sub-Area, Class "K," Grade 7, £786/£804/£822.
West Central Sub-Area, Class "K," Grade 7, £786/£804/£822.

Applications, stating age, present position, present salary, qualifications and experience, and whether married or single, together with the names and addresses of three referees, should be addressed to the Secretary (Establishments Section), The South Wales Electricity Board, St. Mellons, Cardiff, so as to reach him not later than October 6, 1951.

D. G. DODDS,
Secretary.
(M 206)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following positions :

SHIFT CHARGE ENGINEER—Watts Grove (Poplar) Generating Station.

Applicants should have a sound technical training and practical experience in the operation and control of steam generating plant and switchgear.

Salary and conditions of service in accordance with N.J.B. Schedule A, Class "D," Grade 7, plus London Allowance : £591/3 p.a.

JUNIOR ENGINEER St. Pancras Generating Station.

Applicants must have a good technical training up to Higher National Certificate Standard. The duties will be to assist the engineering staff and the appointment offers good opportunities for gaining generating station operation experience.

Salary and conditions of service in accordance with N.J.B. Schedule A, Class "E," Grade 14 plus London allowance : £400 p.a.

Applications for these positions stating age, qualification and experience should be addressed to the Divisional Secretary, British Electricity Authority, London Division, Ergon House, Horseferry Road, S.W.1, and be received within 14 days of the appearance of this advertisement.

J. N. WAITE,
Divisional Controller.
(M 169)

BRITISH ELECTRICITY AUTHORITY

North Western Division

APPLICATIONS are invited for the following superannuable positions :—

No. 447. ASSISTANT SHIFT CHARGE ENGINEERS—Agecroft (H.P.) Generating Station, Pendlebury, Lancs.

The salaries will be £571-£597 per annum, in accordance with Grade 9, Class "G" of the N.J.B. Agreement.

Technical qualification is desirable, and experience in a modern generating station essential.

No. 564. STATION CHEMIST—Huncoat Generating Station, near Accrington.

The salary will be £625-£643 per annum, in accordance with Grade 7, Class "F" of the N.J.B. Agreement.

Applicants should preferably hold a degree of a British University or the Associateship of the Royal Institute of Chemistry, but consideration will be given to those with the Higher National Certificate and who are studying for the A.R.I.C. or equivalent examination. Experience in the chemical testing and control of water treatment for H.P. boilers is essential, and a good knowledge of coal and oil analysis is desirable.

Applications, quoting vacancy number, stating age, qualifications, present position, and giving full details of education and experience, should be received by the Establishment Officer, British Electricity House, Wilmslow Road, East Didsbury, Manchester 20, not later than October 6, 1951. (M 162)

CROWN AGENTS FOR THE COLONIES

ELECTRICIAN required by the Government of Kenya for the Public Works Department for one tour of four years.

Salary according to age and experience in the scale £550, rising to £715 a year, plus temporary allowance between £65 and £98 a year, according to salary. Outfit allowance £30. Free passages. Gratuity of 13⅓% of total substantive salary payments will be payable on satisfactory completion of service.

Candidates, not over 35 years, must have served an apprenticeship with a reputable firm of electrical contractors or with an electricity supply undertaking and have had considerable experience of electrical installation work.

Apply at once by letter, stating age, full names in block letters, and full particulars of qualifications and experience, and mentioning this paper, to the Crown Agents for the Colonies, 4 Millbank, London S.W.1, quoting M.28879 B, on both letter and envelope. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. (M 187)

BRITISH ELECTRICITY AUTHORITY

South Eastern Division

ASSISTANT SHIFT CHARGE ENGINEER, Brighton "A" Power Station. Applicants should have technical qualifications equivalent to Graduate Membership of either the Institute of Mechanical or Electrical Engineers and should have had responsible experience in the operation of modern high-pressure power-station plant. A good knowledge of the efficient operation of boiler and turbine plant is essential. N.J.B. Conditions of Service and Salary Class "H," Grade 9, £609-£633 p.a. Applications on forms obtainable from Divisional Secretary, B.E.A., S.E. Div., Lower Ham Road, Kingston-upon-Thames, to be returned by October 12, 1951. (M 174)

BRITISH ELECTRICITY AUTHORITY

London Division

APPLICATIONS are invited for the following appointments:

DEPUTY STATION SUPERINTENDENT—Brunswick Wharf Generating Station

Candidates should have received a sound technical and practical training in electrical and mechanical engineering followed by a wide experience in the operation and maintenance of a modern generating plant with pulverised fuel-fired boilers.

The successful candidate will be responsible to the Station Superintendent for the efficient operation and maintenance of the station and will be required to deputise for him in his absence.

Salary and conditions in accordance with N.J.B. Schedule A, Class "G," Grade 3 (based on first section) plus London Allowance = £929 5s. per annum.

GENERAL ASSISTANT ENGINEERS — Transmission Department

Candidates should possess the Higher National Certificate in Electrical Engineering or equivalent qualifications, and should have experience in the operation and maintenance of a high voltage transmission system or a works training on high voltage switchgear and transformers.

Salary and conditions in accordance with N.J.B. Schedule C, Class "AX EX," Grade 8, plus London Allowance = £462 to £673 1s. per annum.

ASSISTANT ENGINEER (Efficiency and Testing)—Fulham Generating Station

Candidates should possess the Higher National Certificate in Mechanical and/or Electrical Engineering, or other equivalent qualifications, and have a sound technical training in thermo-dynamics, combustion and allied matters.

The successful candidate will be required to keep a check on all matters concerning the efficiency of operation of the station to generally supervise the compilation of all operating returns and statistics, and to carry out tests on any matters requiring investigation.

Salary and conditions in accordance with N.J.B. Schedule A, Class "K," Grade 11, plus London Allowance = £637 7s. per annum.

JUNIOR ENGINEER (Shift)—Battersea Generating Station

Applications are invited for the above position for duties on the station 3·3 kV switchboards.

Candidates should have received a sound engineering training with subsequent experience in a generating station preferably have gained a National or Higher National Certificate in Electrical Engineering.

Salary and conditions in accordance with N.J.B. Schedule A, Class "K," Grade 15, plus London Allowance = £483 per annum.

JUNIOR ENGINEERS—Blackwall Point Generating Station

Applications are invited for the above positions for general duties in the station.

Applicants should have received a sound technical training and preferably have had some experience in the control room of a modern generating station.

Salary and conditions in accordance with N.J.B. Schedule A, Class "F," Grade 14, plus London Allowance = £417 per annum.

All the foregoing posts are superannuable.

Applications, stating age, qualification and experience, should be addressed to the Divisional Secretary, British Electricity Authority, London Division, Ergon House, Horseferry Road, Westminster S.W.1, to be received within 14 days of the publication of this advertisement.

J. N. WAITE,
Divisional Controller.
(M 224)

CROWN AGENTS FOR THE COLONIES

TECHNICAL INSTRUCTOR (ELECTRICAL ENGINEERING) required by the Nigerian Government Education Department for one tour of 18 to 24 months, with prospect of permanency. Commencing salary according to age and experience, in scale £711 rising to £1,042 a year, including expatriation pay and temporary increase. Outfit allowance £60. Free passages for the officer and his wife and assistance towards cost of children's passages or their maintenance in this country. Liberal leave on full salary. Candidates, under 40 years of age, must have served an apprenticeship to electrical engineering and be experienced practical tradesmen. They should possess recognised technological qualifications and have had experience of apprentice training. Teaching experience an advantage. Apply at once by letter, stating age, full names in block letters, and full particulars of qualifications and experience, and mentioning this paper, to the Crown Agents for the Colonies, 4 Millbank, London S.W.1, quoting M.25341.B. on both letter and envelope. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. (M 219)

SOUTH EASTERN ELECTRICITY BOARD

Kent Sub-Area Headquarters

THIRD ASSISTANT ENGINEER (OPERATION AND MAINTENANCE)

SALARY £646 to £674 p.a. under N.J.B. Schedule, Class "K," Grade 10. Superannuation will be arranged. Applicants should be suitably qualified and have had sound engineering training and responsible experience in the maintenance and operation of an extensive urban and rural transmission and distribution system, both overhead and underground, including substations up to 33 kV. Applicants should be conversant with fault locating and protective systems and calculations.

Applications, giving two referees, must reach H. F. Knell, J.P., M.I.E.E., Kent Manager, SEEBoard, 178-184 High Street, Rochester, Kent, by October 8, 1951.

Brighton and Hove District

METER TESTERS (TWO)

Wages 3s. 2½d. per hour for 44-hour 5-day week under the N.J.I.C. Agreement for manual workers in the Electricity Supply Industry. Applicants must be experienced in testing to the requirements of the Electricity Supply Meters Act, d.c., a.c., single-phase and polyphase meters.

Applications, giving two referees, must reach E. H. Skinner, M.I.E.E., Brighton and Hove District Manager, SEEBoard, Electric House, Castle Square, Brighton 1, by October 8, 1951.

A. L. BURNELL,
Secretary.
September, 1951. (M 215)

EASTERN ELECTRICITY BOARD

Chilterns Sub-Area

DISTRICT SENIOR COMMERCIAL ASSISTANT (Operational)
HEMEL HEMPSTEAD

APPLICATIONS are invited for the appointment of District Senior Commercial Assistant (Operational) in the Hemel Hempstead District of the Chilterns Sub-Area.

The successful candidate will be responsible to the District Commercial Engineer for the electrical installation and maintenance service and should have considerable experience of this type of work and of estimating for electrical installations in factories, housing estates, domestic premises, farms and nurseries. He should also be competent to advise consumers on all matters relating to tariffs and the sale and installation of electrical apparatus. A Higher National Certificate in Electrical Engineering or its equivalent would be an advantage.

The provisional annual salary for the appointment will be £600, and both future salary and conditions of service will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidate will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Applications, stating age, education, technical qualifications and experience, with details of present appointment and salary, should be submitted to The District Manager, Hemel Hempstead, Eastern Electricity Board, The Marlowes, Hemel Hempstead, Herts, within 14 days of the appearance of this advertisement. (M 217)

BRITISH ELECTRICITY AUTHORITY

South Wales Division

APPLICATIONS are invited for the following appointments at salaries in accordance with the revised National Joint Board Schedule.

(1) SECOND OR THIRD ASSISTANT ENGINEER (according to experience) in the Technical Department of this Divisional Headquarters. Salary, Class "AX/CX," Grade 2 (£752 to £938 per annum), or Class "AX/CX," Grade 5 (£579 to £753 per annum).

(2) ASSISTANT MECHANICAL MAINTENANCE ENGINEER, Tir John Power Station, Swansea, Class "G," Grade 9 (£571 to £597 per annum).

Applicants for appointment (1) should preferably possess a B.Sc. degree or the Higher National Certificate (Electrical), and should have had previous experience in a manufacturing works in the testing and commissioning of electrical equipment, including protective gear.

For appointment (2) applicants should preferably have obtained the Higher National Certificate or its equivalent and served a regular apprenticeship. Sound experience in the operation and maintenance of H.P. and L.P. boilers and turbines will be considered an advantage.

The appointments will be superannuable in accordance with the British Electricity Authority and Area Boards' Scheme.

Forms of application may be obtained from the Divisional Secretary at the address below, to whom completed application forms should be returned not later than October 10, 1951.

H. V. PUGH,
Divisional Controller.
The British Electricity Authority,
Cardiff (Pengam Moors) Airport, Cardiff.
September 19, 1951. (M 223)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

MAINTENANCE ENGINEER
HINCKLEY AND WARWICK

APPLICATIONS are invited from suitably qualified Mechanical Engineers for the position of Maintenance Engineer. Successful applicant will normally be stationed at the Warwick Generating Station (48 MW), but will have responsibilities at Hinckley Generating Station (6 MW).

Applicants should have had a sound engineering training and good practical experience of all mechanical repairs and maintenance.

Salary will be in accordance with Class "F", Grade 6 of the National Joint Board Schedule (£660-£692 p.a.). A house will be available for the successful applicant.

The post will be superannuable within the terms and conditions of the British Electricity Authority and Area Boards' Superannuation Scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, British Electricity House, Barker Gate, Nottingham and should be returned not later than October 15, 1951.

L. F. JEFFREY,
Divisional Controller.
(M 186)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the position of GENERAL ASSISTANT ENGINEER (Construction) in the Generation Construction Department.

The successful applicant will be required to act as Assistant to the Site Engineer at the Northampton Power Station.

Applicants must hold the Higher National Certificate in Electrical Engineering or be Graduate Members of the I.E.E., and should preferably have had workshop training.

Salary and conditions of service will be in accordance with the National Joint Board Schedule, Class "AX" (8), commencing at £437 per annum.

The post is superannuable within the provisions of the British Electricity Authority and Area Boards' Superannuation Scheme.

Forms of application, which may be obtained from the Divisional Establishments Officer, British Electricity Authority, British Electricity House, Barker Gate, Nottingham, should be returned not later than October 8, 1951.

L. F. JEFFREY,
Divisional Controller.

September 13, 1951 (M 148)

BRITISH ELECTRICITY AUTHORITY

Midlands Division

APPLICATIONS are invited for the position of DEPUTY STATION SUPERINTENDENT at Meaford Generating Station, Class "G," Grade 3, commencing salary £685, per annum.

The successful applicant will be responsible to the Station Superintendent for the efficient operation and maintenance of the station, and in his absence will be required to assume full responsibility for all matters in connection therewith. Experience with the operation of pulverised fuel fired boilers is essential. Applicants should preferably be members of one of the senior Engineering Institutions.

Salary and conditions of service will be in accordance with the N.J.B. Agreement, and superannuation under terms approved by the British Electricity Authority.

Applications should be made on forms which may be obtained from the Establishments Officer, 53 Wake Green Road, Moseley, Birmingham 13, and be returned not later than October 13, 1951.

F. W. LAWTON,
Divisional Controller.
(M 222)

MIDLANDS ELECTRICITY BOARD

Shropshire and Herefordshire Sub-Area

APPLICATIONS are invited for the position of ENGINEERING DRAUGHTSMAN in the Leominster District Office.

Applicants should have had experience in the execution of mains records and the preparation of plans for mains extensions and substation lay-outs.

The salary will be in accordance with Schedule D, Grade 6 of the National Joint Board, £375 to £500 per annum, according to experience.

Applications, stating age, qualifications, experience and present salary, should be sent within 14 days to Mr. W. Winwood, Sub-Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury.

A. STEPHENS,
Secretary.

September 21, 1951. (M 225)

THE ELECTRICITY CORPORATION OF NIGERIA

is seeking to establish a resource-survey and development department under the direction of an officer designated

DEVELOPMENT ENGINEER

The total annual emoluments attaching to this post are £2,100 on contract terms, plus a gratuity accumulating at £150 per annum and payable at end of service; or on a permanent pensionable basis the total salary would be £1,885 per annum, the Corporation paying the whole of the pension contributions, amounting to approximately 22½% per annum.

There are transport allowances, substantial paid leave, free medical and dental treatment, a furnished house at a rental of £150 a year, and other privileges.

The climate in Nigeria is hot and frequently humid, but life can be healthy and pleasant: there is ample opportunity for sports and social life.

Qualifications essential are corporate membership of the Institution of Electrical Engineers or a good degree in electrical engineering.

Age limit for the contract appointment would be 50, but for the pensionable appointment 45.

TECHNICAL ASSISTANTS

of varying grades are also required in the same department at somewhat lower total salaries, but enjoying similar privileges and allowances. Full particulars from:—

E. C. INSTON, Esq.,
THE ELECTRICITY CORPORATION OF NIGERIA
The Corner House, Great Peter Street, London, S.W.1
(M 210p)

BRITISH ELECTRICITY AUTHORITY

South Eastern Division

JUNIOR CHEMIST AT BRIGHTON 'A' POWER STATION

APPLICANTS should have had experience in analysis and testing of coal, oil and water, and should preferably have received a technical education up to Inter-B.Sc. standard. N.J.B. conditions of service and salary, Class "H," Grades 17 to 14, commencing at £375 per annum. Applications on forms obtainable from Divisional Secretary, B.E.A., S.E. Division, Lower Ham Road, Kingston-upon-Thames, to be received by October 10, 1951.

ASSISTANT ENGINEER (EFFICIENCY AND PLANT TESTING), CROYDON 'B' POWER STATION.

Candidates, who should preferably possess Higher National Certificate will be required to assist in maintaining efficient plant operation, in plant testing and investigation, and in the maintenance of operation records. N.J.B. conditions of service and salary, Class "J," Grade 9, commencing at £646 per annum, plus London Allowance. Applications on forms obtainable from Divisional Secretary, B.E.A., S.E. Division, Lower Ham Road, Kingston-upon-Thames, to be received by October 10, 1951. (M 226)

BRITISH ELECTRICITY AUTHORITY

North-Western Division

VACANCY No. 446 (re-issue)

APPLICATIONS are invited for the position of ASSISTANT SHIFT CHARGE ENGINEER at Westwood Generating Station, Wigan.

The salary for this position, which is superannuable, will be £571 to £597 per annum, in accordance with Grade 9, Class "G," of the N.J.B. Agreement.

Candidates should preferably possess technical qualifications, and previous experience in a generating station is essential.

Applications, quoting vacancy number, stating age, qualifications, present position, and giving full details of education and experience, should be received by the Establishment Officer, British Electricity House, Wilmslow Road, East Didsbury, Manchester 20, not later than October 6, 1951. (M 218)

SOUTHERN ELECTRICITY BOARD

APPLICATIONS are invited for the following posts:

SENIOR DRAUGHTSMAN

Sub-Area Engineer's Department, Bournemouth. Salary N.J.B. Schedule D, Grade 5 (£500 to £600 per annum), N.J.B. conditions of service.

Candidates should have had training and experience in the design and construction of buildings and civil engineering works of an industrial type generally, and in addition, although this is not essential, some experience in the construction of electricity showrooms and offices. Experience in taking off quantities, preparing bills of quantities and of checking building and civil engineering contractors' accounts is essential.

Applications on forms obtainable from the Sub-Area Secretary, 1 Priory Road, Bournemouth, and returned to him not later than October 9, 1951.

LOCAL ENGINEER

Yorktown, Bracknell District of No. 1 (Southall) Sub-Area. Salary N.J.B. Class "E," Grade 9, Column 1 (£519 per annum), N.J.B. conditions of service.

Applicants should have had experience in the operation of h.v. and l.v. overhead and underground distribution systems and substation plant. The successful applicant will be required to carry out construction work on the l.v. system together with such general duties as may be allocated by the District Engineer. The appointment will involve stand-by duties.

Applications on forms obtainable from the Sub-Area Secretary, 2-6 Windmill Lane, Southall, Middlesex, and returned to him not later than October 9, 1951.

JUNIOR ENGINEER

Sub-Area Engineer's Department, Southall, based at Waterloo Road, Uxbridge. Salary N.J.B. Class "L," Grade 16, Column 1 (£486 per annum), N.J.B. conditions of service.

Duties will cover all technical aspects of h.v. and l.v. networks, substations, etc., and will include affording assistance, generally, to the Deputy Sub-Area Engineer.

Applications on forms obtainable from the Sub-Area Secretary, 2-6 Windmill Lane, Southall, Middlesex, and returned to him not later than October 9, 1951.

The successful candidates for the above appointments will be required to contribute to the B.E.A. and Area Boards' Superannuation Scheme, if eligible.

F. W. KEMPTON,
Secretary.

September 27, 1951. (M 216)

MIDLANDS ELECTRICITY BOARD

SENIOR ASSISTANT ENGINEER
(Primary System Planning)

APPLICATIONS are invited for the above appointment on the Chief Engineer's staff at the headquarters of the Midlands Electricity Board, Mucklow Hill, Halesowen, near Birmingham.

Applicants should have received a thorough training in the electricity supply industry and should have considerable experience in the planning of high voltage transmission and distribution systems.

Appropriate technical qualifications will be considered an advantage.

The conditions of service will be in accordance with the National Joint Board Agreement, and the salary, subject to negotiation, will be Schedule C, Grade 1, Class "AX DX," £884 to £1,106 per annum, the commencing figure being determined according to qualifications and experience.

Applications, stating age, experience and qualifications, should be made within 14 days to the Secretary (Ref. F.W.C.), Midlands Electricity Board, Board Headquarters, Mucklow Hill, Halesowen, nr. Birmingham.

A. STEPHENS,
Secretary.

September 18, 1951. (M 201)

BRITISH ELECTRICITY AUTHORITY

COMMERCIAL DEPARTMENT, HEADQUARTERS, LONDON

BRITISH ELECTRICITY AUTHORITY invite applications for two appointments as SENIOR COMMERCIAL ASSISTANT in the Commercial Department at their headquarters in London.

Applicants should have extensive experience in the distribution and commercial activities, and the general economics, of the Electricity Supply Industry, and preference will be given to those who are chartered electrical engineers or possess an engineering degree.

The salary for the appointments, which are superannuable, will be within the provisional salary scale £1,100 p.a. x £50 to £1,400 p.a., according to qualifications and experience.

Applications, stating age, present salary and giving full details of qualifications and experience, should be forwarded to D. Moffat, Director of Establishments, British Electricity House, Great Portland Street, London W.1, so as to be received not later than October 13, 1951. Please quote reference AE 207. (M 171)

CROWN AGENTS FOR THE COLONIES

SENIOR INSTRUCTOR (ELECTRICAL) required by the Malayan Federation Government for 3 years with prospect of permanency. Commencing salary (including expatriation pay) according to age and experience payable in local currency equivalent at the present Government rate of exchange to £714 a year rising to £1,078 a year. Cost of living allowance between £136 to £616 a year according to salary and dependants. Free passages. Liberal leave on full salary. Candidates, under 35, must have served an apprenticeship to electrical engineering and have been employed as a foreman on public works or large contracts. They must be thoroughly experienced in electrical installation trade practice and domestic and industrial wiring (including motors, generators, etc.) and should possess a full electrician's Certificate (or Final Certificate in Electrical Engineering Practice) of the City and Guilds, or equivalent. Some teaching experience desirable.

Apply at once, by letter, stating age, full names in block letters, and full particulars of qualifications and experience and mentioning this paper, to the Crown Agents for the Colonies, 4 Millbank, London S.W.1, quoting M.25359B on both letter and envelope. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. (M 207)

SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the position of ASSISTANT ENGINEER in District 443 (Ebbw Vale) in the Eastern Sub-Area of the Board.

Applicants should be suitably qualified and have had experience in the construction, operation and maintenance of substations and underground and overhead high and low voltage mains in urban and rural areas.

The salary for the position will be in accordance with Class "E", Grade 7 (£579-£594-£609) of the National Joint Board Schedule for the Electricity Supply Industry.

Applications, stating age, present position, present salary, qualifications and experience, and whether married or single, together with the names and addresses of three referees, should be addressed to the Secretary (Establishments Section), The South Wales Electricity Board, St. Mellons, Cardiff, so as to reach him not later than October 6, 1951.

D. G. DODDS,
Secretary.
(M 189)

MIDLANDS ELECTRICITY BOARD

Central Gloucestershire Sub-Area

APPOINTMENT OF ENGINEERING DRAUGHTSMAN

APPLICATIONS are invited for the position of Engineering Draughtsman in the Stroud District of the Central Gloucestershire Sub-Area.

Applicants should have a knowledge of distribution and substation plant alterations and the preparation of plans for Statutory Notices. Experience in survey work and profile drawings will be an advantage.

Conditions of service will be in accordance with the National Joint Board Agreement and the salary will be Schedule D, Grade 6, £375 to £500 per annum.

Applications, stating age, education, experience and qualifications, should be forwarded within fourteen days to Mr. D. Holt, Sub-Area Manager, Midlands Electricity Board, 126 London Road, Gloucester.

A. STEPHENS,
Secretary.

September 14, 1951. (M 199)

BRITISH ELECTRICITY AUTHORITY

East Midlands Division

JUNIOR ENGINEER (LABORATORY)

APPLICATIONS are invited for the appointment of Junior Engineer (Laboratory) at Freemen's Meadow Generating Station, Leicester.

Duties consist of routine sampling and analysis of fuels, oils and waters, etc., and candidates should preferably have some laboratory experience.

The salary and conditions of service will be in accordance with the N.J.B. Agreement, Class "H," Grade 15, £412 per annum.

Applications should be submitted on the official form, which may be obtained from the Divisional Establishments Officer, British Electricity Authority, British Electricity House, Barker Gate, Nottingham, and should be returned not later than October 8, 1951.

L. F. JEFFREY,
Divisional Controller.

September 13, 1951. (M 147)

YORKSHIRE ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:—

No. 3 (Sheffield) Sub-Area

FIRST ASSISTANT DISTRICT ENGINEER (Mexborough Maltby) (Vacancy No. 107/51).

Applicants must have technical qualifications equivalent to corporate membership of the Institution of Electrical Engineers with training and experience fitting them to take charge of substation and mains construction, operation and maintenance work in a mixed industrial and rural area in which are 66 kV, 11 kV and l.v. underground and overhead systems of electricity mains.

The successful candidate will be expected to take personal charge of the more responsible construction and maintenance work on the 11 kV and l.v. systems in the District.

Salary—N.J.B. Agreement, Class "E," Grade 4, £722 £752 per annum.

Applications, stating the above vacancy number, and giving full details of age, qualifications, and experience, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial Street, Sheffield, within fourteen days of the appearance of this advertisement.

No. 4 (Leeds) Sub-Area

THIRD ASSISTANT ENGINEER (Construction) (Vacancy No. 109/51)

Applicants should be corporate members or graduates of the Institution of Electrical Engineers or possess equivalent qualifications, and should have had a wide experience in the design, construction, operation and maintenance of overhead and underground distribution networks up to and including 33 kV. Experience in the preparation of tenders and supervision of large contracts for h.v. mains is essential. The successful candidate will be required to reside within the Sub-Area.

Salary—N.J.B. Agreement, Class "K," Grade 10, £646 £674 per annum.

Applications, stating the above vacancy number, and giving full details of age, qualifications and experience, should be forwarded to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, Leeds, within fourteen days of the appearance of this advertisement. (M 208)

ENFIELD CABLES LIMITED

need a SENIOR ASSISTANT in PUBLICITY Department, age 30-40 years. Electrical knowledge, able to produce own roughs and visuals for the technical press, catalogues and other literature.

Knowledge of modern packing design, window displays and exhibitions. Information to the Associate Director of Home Sales, Enfield Cables, Ltd., Victoria House, Southampton Row, W.C.1. (M 195p)

APPLICATIONS are invited for vacancies in the Purchasing Dept. of a large electrical engineering manufacturer in the Midlands: (1) SENIOR EXECUTIVE BUYER with first class experience of bulk buying of all classes of relevant materials, particularly steel forgings and castings. Salary £600-£800 per annum. (2) TWO SENIOR EXECUTIVE ASSISTANTS for purchasing and internal administrative work in the department. Salary according to age and experience. Permanent positions, pension scheme. Successful applicants will have to find own accommodation, but for a limited period arrangement will be made in appropriate cases for special assistance.—Write, stating age, qualifications, experience and quoting Ref. ICE, to Box No. 1065, Electrical Times. (M 178)

APPOINTMENTS OVERSEAS. The English Electric Company wishes to make a number of important appointments to their overseas organisation. Commercial experience and a good background of heavy electrical engineering are required. Previous overseas experience an advantage but not essential.—Applicants should write, giving full details and quoting Ref. 933, to Central Personnel Services, English Electric Company Ltd., 24-30 Gillingham Street, London S.W.1. (M 151)

ASSISTANT electrical maintenance PLANNING ENGINEER is required by the Steel Company of Wales Ltd., Abbey Works, Port Talbot. Candidates must have previous steel works experience in electrical engineering and should possess Higher National Certificate or equivalent.—Applications in writing, stating education, training and experience, should be submitted to: The Personnel Superintendent, The Steel Company of Wales Ltd., P.O. Box No. 3, Port Talbot. (M 153)

ASSISTANT for Sales Export Rubber Cable Department. —Write in confidence, stating qualifications, experience and salary required to Cable Dept., Edison Swan Electric Co. Ltd., 155 Charing Cross Road, London W.C.2. (M 191)

ASSISTANT SWITCHGEAR SALES ENGINEERS (inside) required to deal with inquiries and orders for power and substation switchgear. Good prospects for competent men.—Apply, giving details of qualifications and experience, to Personnel Manager, Ferguson Pailin, Ltd., Higher Openshaw, Manchester 11. (M 121)

CHARGE ENGINEERS (operational) required at large industrial power plant. Applicants should have a thorough understanding of electrical power and process steam generation. Practical experience in electrical power distribution desirable but not essential. Commencing salary £800 per annum. Pension scheme. Age not less than 35 years.—Write, giving full particulars of experience and age to Box No. 1081, Electrical Times. (M 304)

CHARGEHAND ELECTRICIAN required by Richard Costain Ltd., for service in Uganda. Must have served a full apprenticeship. Will be required for all types of installation in conduit, etc., including neon; also intercom. telephones. Knowledge of refrigeration plant would be a definite advantage. Age preferably 25-35. Initial contract of three years' duration with opportunity of renewal. Wives and or families may follow after 6-9 months.—Apply in writing, giving full details of experience to Personnel Director, Richard Costain Ltd., Dolphin Square, London, S.W.1. (M 177)

DESIGN DRAUGHTSMAN required for interesting work on small mass-produced electro-mechanical devices. West London area.—Box No. 1053, Electrical Times. (M 154)

DRAUGHTSMAN required with some electrical experience for works in Worsley, Manchester.—Please write, stating age, experience and salary required, to Box No. 1079, Electrical Times. (M 301)

DRAUGHTSMEN. Vacancies exist on the permanent staff of Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, for Draughtsmen with at least ten years experience in the design of light and medium gears, fabricated structures and electro-mechanical equipment. Must be capable of working without supervision.—Apply in writing, stating age, experience, qualifications, salary required, etc., marking envelopes "Electronic Control," to Personnel Manager, Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester 17. (M 106)

DRAUGHTSMEN. Three senior draughtsmen required, with initiative and ability to develop new manufacturing projects from first conception. Experience should include industrial building design and or layout of power distribution systems. Salaries commensurate with ability. Profit sharing and pension schemes. Permanent positions which offer unlimited scope.—Apply, quoting ref C.P.3, to Staff Personnel Manager, S. Smith and Sons (England) Ltd., Cricklewood Works, N.W.2. (M 176)

DRAUGHTSMEN and DESIGNERS required by Electricity Meter Manufacturer, N.W. London. Experience with precision mass production mechanisms desirable. Good salary with prospects for suitable men; staff pensions.—Full particulars, stating salary expected, to Box No. 1027, Electrical Times. (M 84)

ELECTRICAL wholesaler requires REPRESENTATIVES for Scotland and North of England. Must be car owners and have previous experience and connections.—Please write, stating age, experience and remuneration required, Box No. 1059, Electrical Times. (M 163)

ELECTRICAL wholesaler requires REPRESENTATIVES for Kent, Sussex, Surrey and Hants to take over existing connections and extend business. Applicants must be car owners, have previous experience and some connections in the area. Accommodation could be arranged after trial period. Salary, expenses and commission paid.—Please write in strict confidence, stating age, experience and references, Box No. 1061, Electrical Times. (M 164)

LAMP Sales Dept. of E.L.M.A. Company in Central London has vacancy for YOUNG MAN, preferably under 30 years, capable of corresponding and dealing with technical matters. Electrical knowledge and commercial experience necessary. Pension scheme. 5-day week.—Apply, stating age, experience and salary required, to Box No. 1077, Electrical Times. (M 228)

OLD-ESTABLISHED British Cable Manufacturers require TECHNICAL ASSISTANT for contract work in India and Pakistan. Duties involving preparation of technical details for cable and overhead line installations and preparations of tenders. Age 23-30 years, single. Commencing salary, including Dearness Allowance, ranging from £889 to £1,060 per annum, according to age and qualifications.—Applicants should write, stating age, qualifications and giving full particulars of previous experience to Box No. 1069, Electrical Times. (M 190)

BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2

MAINS ENGINEERS—The Calcutta Electric Supply Corporation, Ltd., invite applications from fully qualified Electrical Engineers for appointment to their Mains Department in Calcutta. Candidates must fulfil the following qualifications: (1) Age: Between 25 and 40 years. (2) Education: Graduate membership of the Institution of Electrical Engineers or candidates should have passed an examination equivalent to the Associate Membership Examination of that body. (3) Experience: Thorough working knowledge of modern overhead and underground distribution practice and experience in the erection and maintenance of overhead lines and underground h.t. and l.t. distribution networks. Preference will be given to candidates whose education and experience fit them for appointment as District Engineers after a short period of instruction in the Corporation's system in Calcutta. The appointments are permanent and selected candidates will be required to sign an agreement for three years. The monthly salary is in the grade Rs. 700-40-820 (Efficiency Bar), 900-45-1,035 (Efficiency Bar), 1,075-50-1,275 plus Overseas Pay, minimum Rs. 200 monthly, plus Overseas Marriage Allowance of Rs. 250 monthly (the present rupee exchange is 1s. 6d.). The starting salary in the above grade of selected candidates will be fixed by reference to their training, experience and fitness for appointment as District Engineers. There are in addition other generous allowances, including a Cost-of-Living Allowance. Free quarters are provided or a House Allowance in lieu thereof. There is also free medical attention and liberal leave and Passage Allowances. Contributory Provident Fund, etc. Applications, giving age, details of training, experience, present position held, should be addressed to The Secretary, Calcutta Electric Supply Corporation, Ltd., Victoria House, Vernon Place, Bloomsbury Square, London W.C.1. (M 74)

OPENINGS for two ELECTRICAL DRAUGHTSMEN between 40 and 50 years of age, West Midlands. Preferably experienced cranes and heavy steelworks plants, layouts and diagrams. Compulsory pension scheme, good canteen facilities, five-day week with some overtime. State age, present salary and give references.—Reply to: Chief Electrical Engineer, The Wellman, Smith, Owen Engineering Corporation Ltd., Darlaston, South Staffs. (M 165)

POWER STATION OR MARINE ENGINEERS.—Applications are invited by the Calcutta Electric Supply Corporation, Ltd., for appointment to the posts of SHIFT CHARGE ENGINEERS in Calcutta, where the company has three generating stations, each over 100 mW capacity. Candidates must either have had responsible operating experience in modern large high-pressure steam-generating stations or, alternatively, must have had marine experience with high-pressure water-tube boilers and turbines, and must hold a First-Class Board of Trade Engineering Certificate; such candidates without previous power-station experience would be required, if selected, to undergo a course of training in the U.K. before proceeding to Calcutta. The appointments are permanent and selected candidates will be required to sign an agreement for three years. The monthly salary is in the Grade Rs. 700-40-820 (E.B.), 900-45-1,035 (E.B.), 1,075-50-1,275, plus overseas pay minimum Rs. 200 monthly, plus overseas marriage allowance Rs. 250 monthly (the present rupee exchange is 1s. 6d.). The starting salary, in the above grade, of selected candidates will be fixed by reference to their training and operating experience. There are, in addition, other generous allowances, including overseas child allowance and cost-of-living allowance. In addition, free furnished quarters are provided, as is also free medical attention. Liberal leave and passage rules. Contributory provident fund, etc. Applications, giving age (about 35 to 40 preferred), details of training, experience, present position held, should be addressed to the Secretary, Calcutta Electric Supply Corporation, Ltd., Victoria House, Vernon Place, Bloomsbury Square, London W.C.1. (M 73)

RADAR ENGINEER. A vacancy exists for a highly competent radar engineer, conversant with the design and production of miniaturised radar and transformer equipment including "C" core types. Attractive salary and assistance with house offered to the right man.—Apply in strict confidence, stating full experience and qualifications, Box No. 1071, Electrical Times. (M 196)

RADIO MECHANICS required for work on centimetre equipments at Stanmore. Previous experience essential. Progressive staff positions; 5-day week.—Write, giving full details of age, experience and qualifications, to the Staff Manager (Ref. GBLC/G/45), Research Laboratories of the General Electric Company Limited, North Wembley, Middx. (M 300)

SALES ENGINEER required by leading electrical manufacturers, connection preferably with Southern and/or South Eastern Electricity Area Boards.—Full particulars, including age and salary required, to Box No. 1075, Electrical Times. (M 227)

SALES ESTIMATOR required, age 25/35, for Contracts Office of Laminated Plastic and Insulation Manufacturers. Electrical Engineering background preferred. Initiative and ability to conduct technical correspondence essential. Prospects of promotion. Pension Scheme.—Write full details of salary required to Box No. 1051, Electrical Times. (M 134)

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Applications, giving full details of training, qualifications, experience, age, present appointment and salary, should be submitted to the Home Sales Manager, address as above, and marked for his personal attention.

Applications will be treated with the strictest confidence. (M 173p)

TECHNICAL ASSISTANTS required by British Insulated Callender's Cables Ltd. for: (a) development and (b) electrical testing of electro static capacitors at their Helsby Works. Candidates should hold National Certificate, Higher National Certificate, or equivalent, in electrical engineering or in chemistry. Permanent position with superannuation and bonus schemes after 12 months' probationary service.—Applications, giving details of qualifications and experience, should be made, in writing, to The Staff Officer, B.I.C.C. Ltd., Prescot, Lancs. (M 180)

THE General Electric Co. Ltd., Witton, Birmingham require an ENGINEER for production planning Only qualified men, having a thorough knowledge of rotating electrical machinery up to the largest types, will be considered.—Applications, stating age, details of training and subsequent experience should be sent, quoting "Engineering Production" to Staff Manager. (M 122)

THE STEEL COMPANY OF WALES, LTD., require INSTRUMENT MECHANICS at the cold reduction plant, Trostre Works, Llanelly. Applicants must be experienced in either electrical or mechanical instruments. —Apply before October 13, 1951, to Supt. Labour and Wages, The Steel Company of Wales, Ltd. (Tinplate Division), Carmarthen Road, Swansea. (M 179)

WANTED—ELECTRICAL FITTERS for appointments at Tir John power station at the current rate of 3/2½ per hour. Wages and conditions of service will be in accordance with the National Joint Industrial Council Agreement. Preference will be given to applicants having experience on heavy electrical plants.—Applications should be made in writing to the Station Superintendent, Tir John Power Station, Port Tennant, Swansea. (M 212)

WELL-KNOWN manufacturing concern require full-time TECHNICAL REPRESENTATIVE for London area. Applicants must have previous experience in the sale of domestic appliances to departmental stores, wholesalers, etc. Salary, commission and expenses offered.—Apply, giving full particulars past experience, to Box No. 1073, Electrical Times. (M 209)

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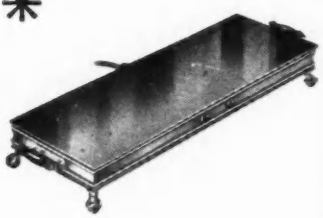

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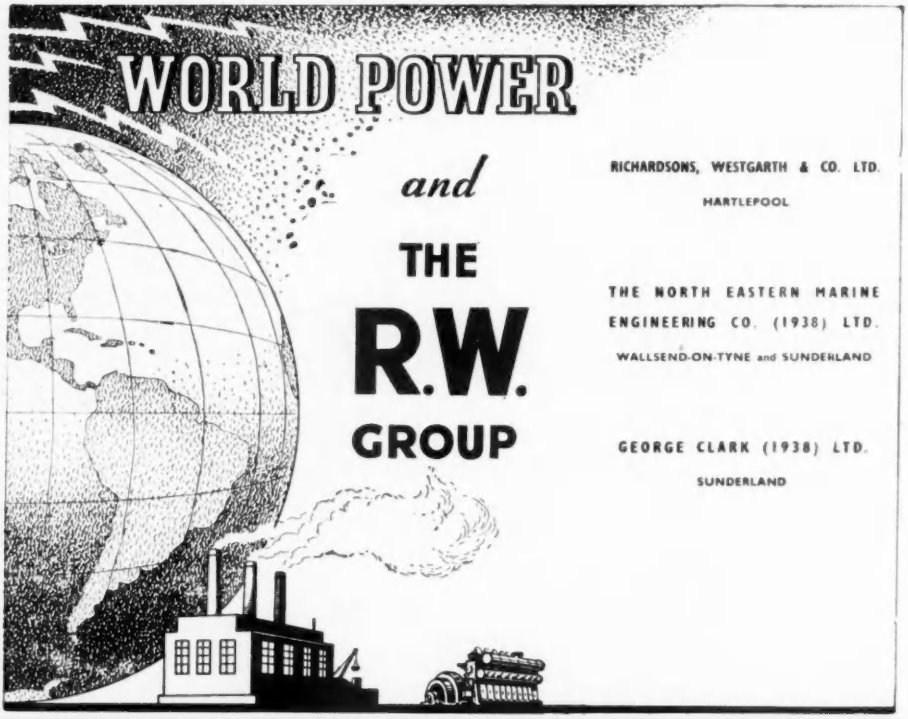
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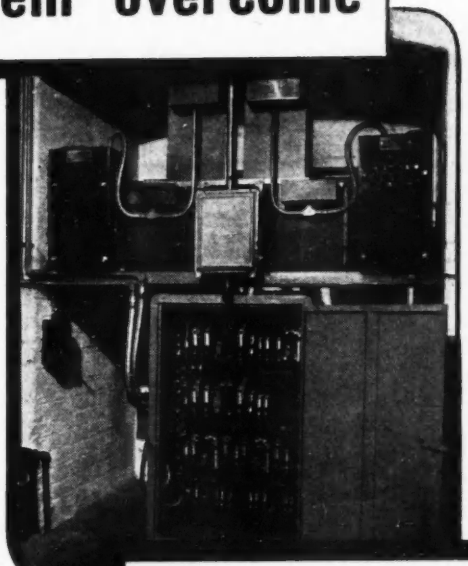

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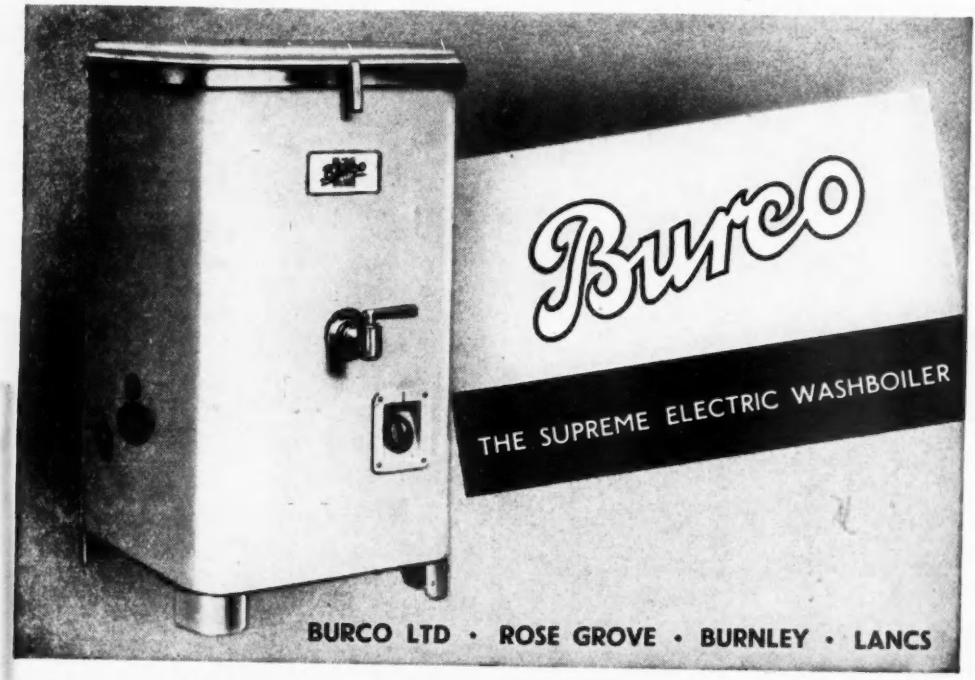

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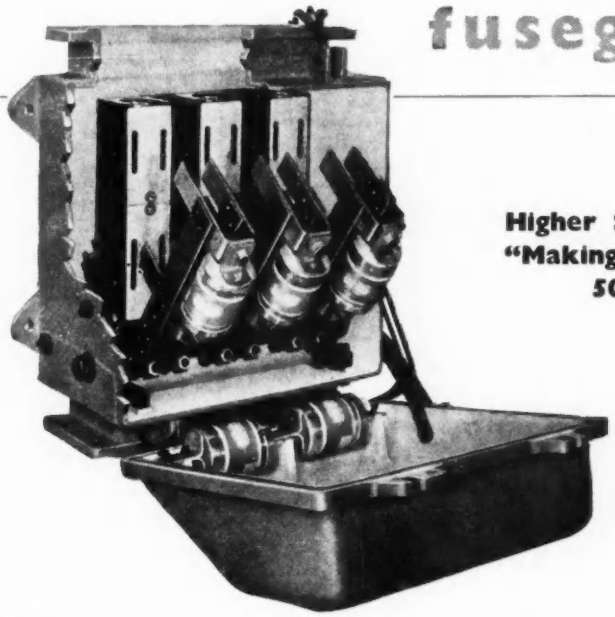

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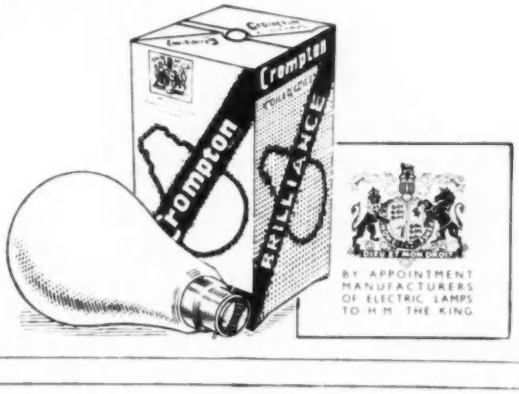

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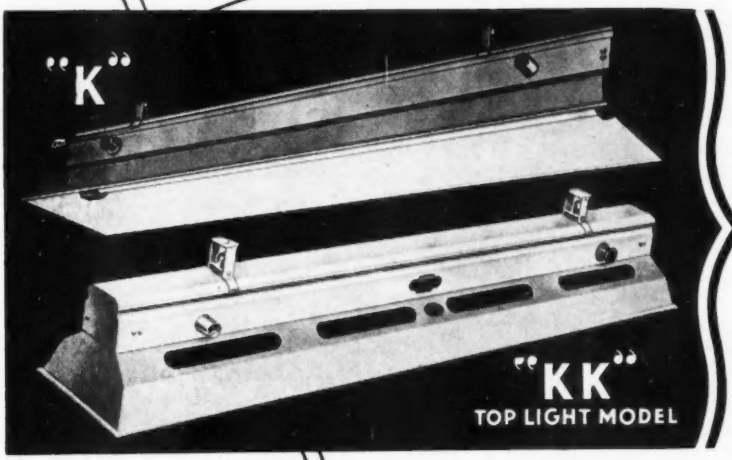

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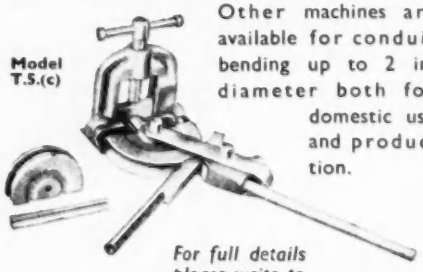

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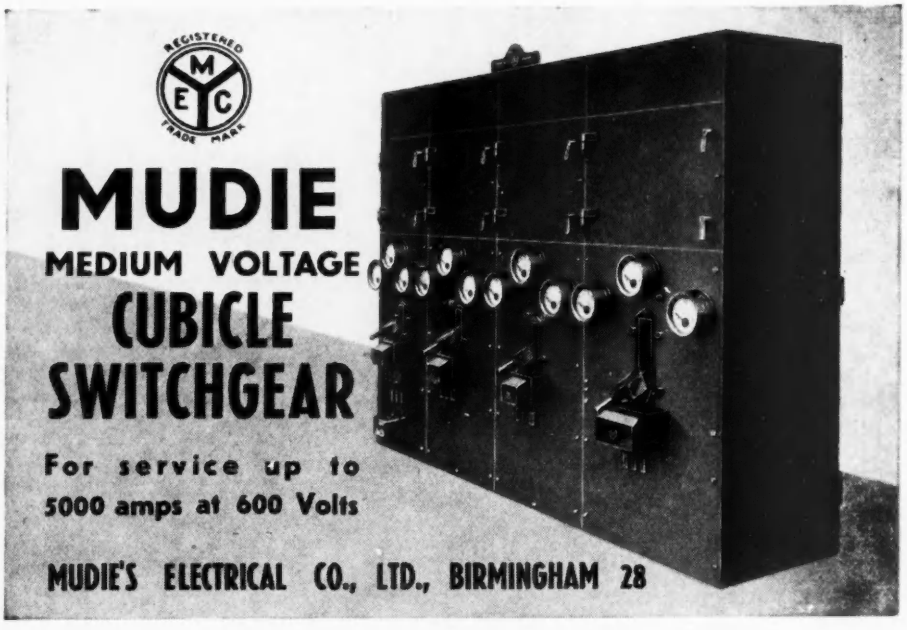

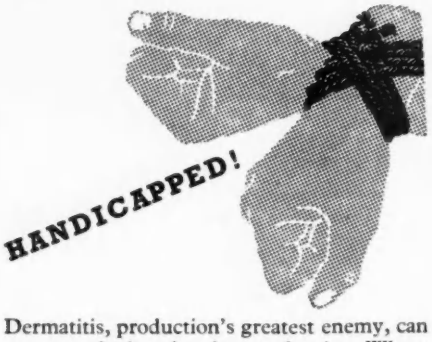

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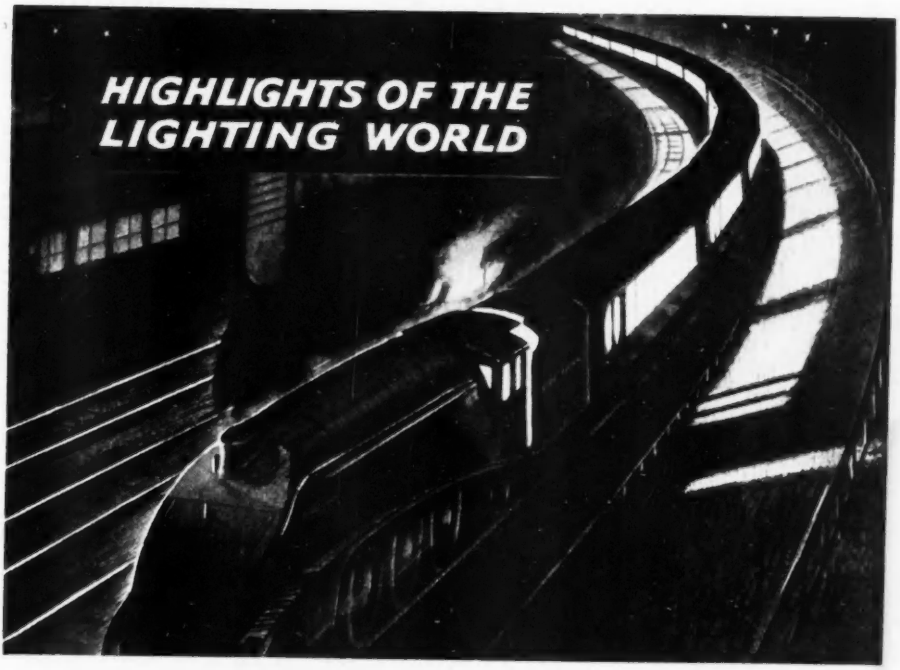

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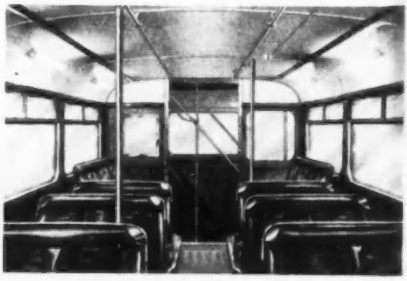

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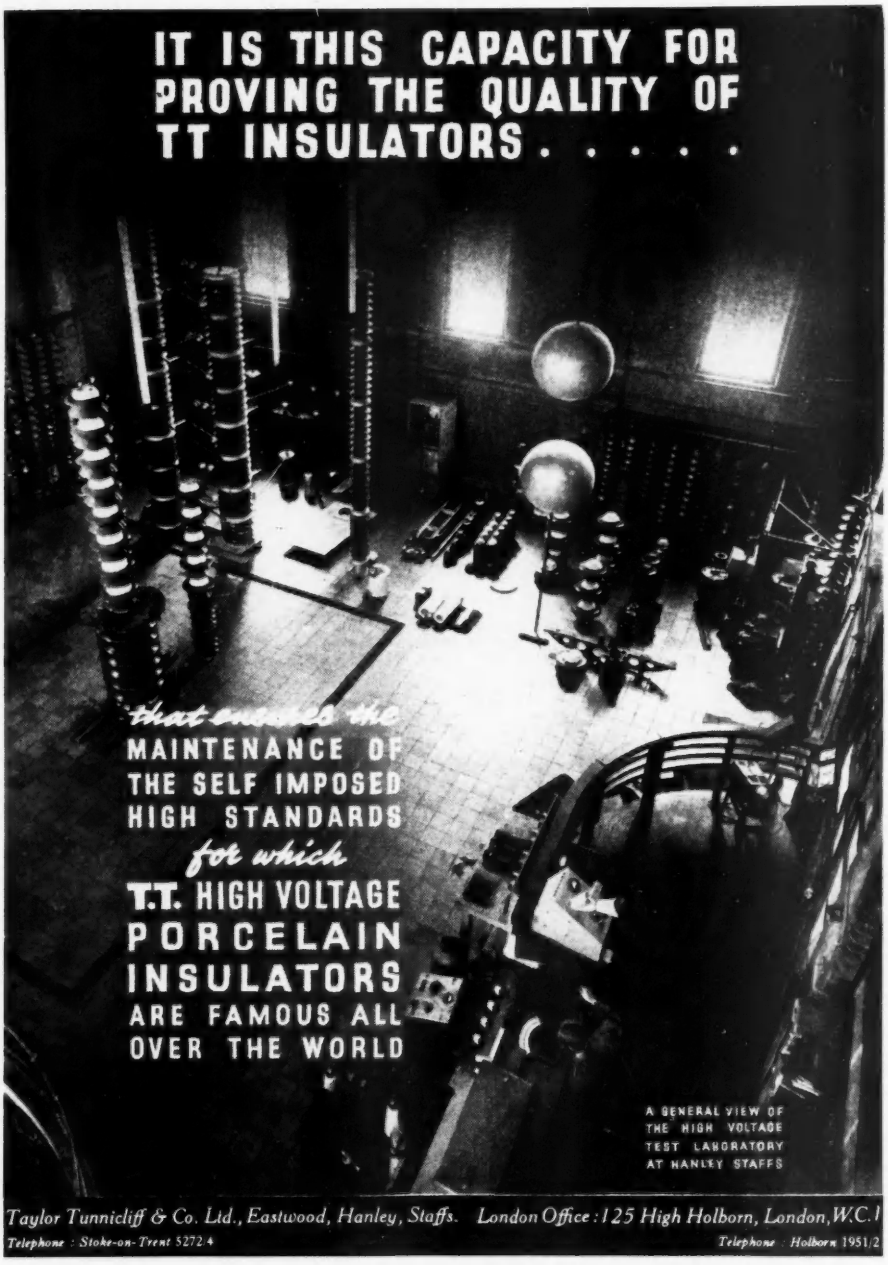
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